Deputy Minister of Mines, B.C.

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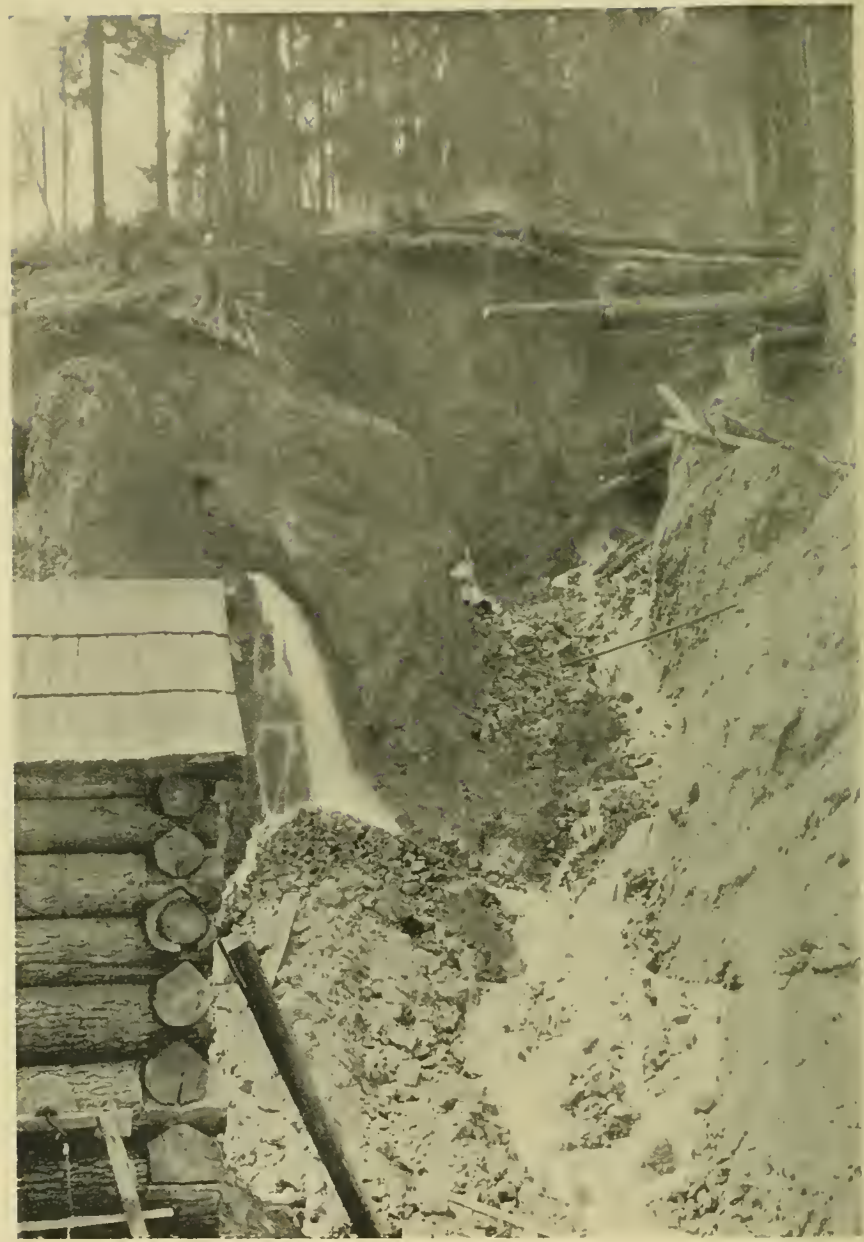

HYDRAULIC MINING OF SILVER-LAED ORE.

Wonderful Mine, Slocan.

(See page 52, Bulletin No. 3.)

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B. C. Mines, Dept. of

ANNUAL REPORT

OF THE

MINISTER OF MINES

FOR THE

YEAR ENDING 31st DECEMBER, 1896,

BEING AN ACCOUNT OF

MINING OPERATIONS FOR GOLD, COAL, ETC.,

IN THE

Province of British Columbia.

191526
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VICTORIA, B. C.:
Printed by RICHARD WOLFENDEN, Printer to the Queen's Most Excellent Majesty.
1897.

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REPORT

OF THE

MINISTER OF MINES,

1896.

To His Honour EDGAR DEWDNEY,
Lieutenant-Governor of the Province of British Columbia

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Mining Industries of the Province for the year 1896 is herewith respectfully submitted.

JAMES BAKER,
Minister of Mines.

Minister of Mines' Office,
26th February, 1896

REPORTS.

MINERAL PRODUCTION OF BRITISH COLUMBIA.

COMPILED BY WILLIAM A. CARLYLE, PROVINCIAL MINERALOGIST.

To the Hon. Jas. Baker,
Minister of Mines.

I have the honour to submit the following tables of the mineral production of the mines of British Columbia.

In compiling these statistics I have sought to assemble for the first time from the best of sources available all statistical information of the mineral out-put from the commencement of mining operations in this Province up to the beginning of the present year, 1897, and the returns in Dr. Geo. M. Dawson's very valuable report on the "Mineral Wealth of British Columbia, 1888," the "Mineral Statistics," by Elfric Drew Ingall, as published in the annual reports of the Geological Survey of Canada, and the returns in the annual reports of the Minister of Mines for British Columbia have been supplemented by returns sent in by the Gold Commissioners and Recorders, and by the smelter and customs returns collected by the Bureau of Mines.

These statistics are as complete as it has been possible to make them, considering the imperfect records kept during the earlier years of production, and that as yet the mine-owners have not been required to give full statements of their mines' out-put, the nearly complete smelting returns given below having been obtained by their courtesy. However, these figures will serve not only to show the total production to date, but also to demonstrate the *recent commencement of lode mining* and the rapid increase now being made in the amounts of gold, silver, lead and copper now being produced in these new mining districts which but a few years ago were trackless wildernesses of mountain, river and forest.

TABLE I.

TOTAL PRODUCTION FOR ALL YEARS.

Gold, placer	$ 57,704,855
Gold, lode	2,177,869
Silver	4,028,224
Lead	1,606,427
Copper	254,802
Coal and Coke	33,934,427
Building stone, bricks, etc	1,200,000
Other metals	25,000
	$100,931,604

The next Table shows the rapid increase in production during the last seven years, the increase for 1891 over 1890 being due to the larger export of coal, the output of which for that year of 1,000,000 tons, being the largest ever reached by our collieries. In the year 1892 the influence of the production of the lode mines began to be felt, and since then the very marked increase in production has been carried by the quickly growing value of the gold, silver, lead and copper produced.

TABLE II.

PRODUCTION FOR EACH YEAR FROM 1890 TO 1896 (INCLUSIVE).

YEAR.	AMOUNT.
1890	$2,608,608
1891	3,546,702
1892	3,017,971
1893	3,588,413
1894	4,225,717
1895	5,655,302
1896	7,146,425

Table III. gives a detailed statement of the amount and value of the different mine products for 1895 and 1896, but it has as yet been impossible to collect statistics concerning the amount of building stone, brick, lime, fire-clay, tiles, etc., hence these tables do not contain any particulars this year about the mining of the economical materials which, of course, should be here included.

However the increase in the value of the precious metals produced, and the baser metals, especially of lead, is marked, and the total increase for 1896 over 1895, very gratifying, the total production of the mines, other than coal, having increased from $2,834,000 to $4,816,000.

TABLE III.

AMOUNT AND VALUE OF MATERIALS PRODUCED 1895 AND 1896.

	Customary Measures.	1895.		1896.	
		Quantity.	Value.	Quantity.	Value.
Gold, Placer	Oz	24,084	$ 481,683	27,201	$ 544,026
" Quartz	Oz	39,264	785,271	62,259	1,244,180
Silver	Oz	1,496,522	977,229	3,135,343	2,100,689
Copper	Lbs	952,840	47,642	3,818,556	190,926
Lead	Lbs	16,475,464	532,255	24,199,977	721,384
Coal	Tons	939,654	2,818,962	846,235	2,327,145
Coke	Tons	452	2,260	615	3,075
Other materials			10,000		15,000
			$5,655,302		$7,146,425

TABLE IV.

Production of Metals per District.

Name.	Divisions.		Districts.	
	1895.	1896.	1895.	1896.
Cariboo			$ 282,400	$ 384,050
Barkerville Division	$ 81,000	$ 82,900		
Lightning Creek "	40,700	53,000		
Quesnellemouth "	18,200	51,100		
Keithley Creek "	142,500	197,050		
Cassiar			22,575	21,000
Kootenay, East			17,575	154,427
Kootenay, West			2,223,206	4,002,735
Ainsworth Division	388,941	189,589		
Nelson "	63,608	515,529		
Slocan "	1,057,677	2,010,048		
Trail Creek "	702,457	1,243,360		
Other parts	10,520	11,209		
Lillooet			40,663	33,665
Yale			241,581	206,078
Osoyoos Division	147,731	131,220		
Similkameen "	41,650	9,000		
Yale "	48,400	65,108		
Other Districts			10,000	15,000
	$2,743,387	$4,592,115	$2,838,000	$4,816,955

Placer Gold.

Table V. gives the yearly production of placer gold as determined by the returns sent in by the banks and express companies of gold sold to the mints, and from returns sent in by the Gold Commissioners and Mining Recorders. To these yearly amounts one-third was added up to the year 1878, and from then to 1895, one-fifth, which proportion was considered to represent approximately, the amount of gold sold of which there was no record.

The gold output is now beginning to steadily rise as the operations of the large hydraulic mining companies in Cariboo begin to assume such a scale, that with larger water supplies and the mines more opened out for work, a much larger amount of ground can be washed.

This placer gold contains from 10 to 25 per cent. silver, but the silver value has not been separated from the totals.

TABLE V.

YIELD OF PLACER GOLD PER YEAR TO DATE.

1858	$ 705,000	1878	$1,275,204
1859	1,615,070	1879	1,290,058
1860	2,228,543	1880	1,013,827
1861	2,666,118	1881	1,046,737
1862	2,656,903	1882	954,085
1863	3,913,563	1883	794,252
1864	3,735,850	1884	736,165
1865	3,491,205	1885	713,738
1866	2,662,106	1886	903,651
1867	2,480,868	1887	693,709
1868	3,372,972	1888	616,731
1869	1,774,978	1889	588,923
1870	1,336,956	1890	490,435
1871	1,799,440	1891	429,811
1872	1,610,972	1892	399,526
1873	1,305,749	1893	356,131
1874	1,844,618	1894	405,516
1875	2,474,004	1895	481,683
1876	1,786,648	1896	544,026
1877	1,608,182		
			$57,704,855

PRODUCTION OF LODE MINING.

The next table shows very clearly the fact that lode mining in this Province has just fairly begun, and that the progress now being made, is decided and very satisfactory.

The gold production of course consists mostly of the output of Rossland mines as per smelter returns, but there are added the gold saved by amalgamation in the Oeoyoos District, as at Camp McKinney, in the Nelson District as at the Poorman Mine, and the product of small lots of gold ore sent out to the smelters from other parts.

Some silver ore is known to have been sold prior to 1887, but no record has been obtained regarding these small sales.

TABLE VI.

PRODUCTION OF LODE MINES.

YEAR.	GOLD.		SILVER.		LEAD.		COPPER.		TOTAL VALUES.
	Oz.	Value.	Oz.	Value.	Pounds.	Value	Pounds.	Value.	
		$		$		$		$	$
1887	....	....	17,690	17,331	....	....	....	....	17,331
1888	....	....	79,780	75,000	....	....	....	....	75,000
1889	....	....	53,192	47,873	....	....	....	....	47,873
1890	....	....	70,427	73,948	113,000	5,805	....	....	79,753
1891	....	....	4,500	4,000	588,665	25,607	....	....	29,607
1892	....	....	77,160	66,935	1,768,420	72,505	....	....	139,440
1893	1,170	23.404	227,000	195,000	2,135,023	78,996	....	....	297,400
1894	6,252	125,014	746,379	470,219	5,662,523	169,875	324,680	16,234	781,342
1895	39,264	785,271	1,496,522	977,229	16,475,464	532,255	952,840	47,642	2,342,397
1896	62,259	1,244,180	3,135,343	2,100,689	24,199,977	721,384	3,818,556	190,926	4,257,179
Totals	108,945	$2,177,869	5,907,993	$4,028,224	50,943,072	$1,606,427	5,096,076	$254,802	$8,067,322

PRODUCTION OF COAL AND COKE.

In Table VII. is given the total number of long tons (2,240lbs.) of coal and coke for each year as reported to the Government by the different collieries in the Province. The production of coke is small, but will be now rapidly increased when the coke ovens, now being perfected at the Union Mines at Comox, and the coking coal of the Crow's Nest Pass, will have begun the regular supply of this fuel to the smelting centres. For the last two years the output of coal has been declining by reason of the increasing competition of British and American coal in the Pacific Coast markets of the United States where most of the coal exported from British Columbia is sold.

TABLE VII.

COAL AND COKE PRODUCTION PER YEAR TO DATE.

YEAR.	TONS (2,240LBS.)	VALUE.	
1836-52	10,000	$ 40,000	
1852-59	25,396	101,592	
1859 (2 months)	1,989	7,956	
1860	14,246	56,988	
1861	13,774	55,096	
1862	18,118	72,472	
1863	21,345	85,380	
1864	28,632	115,528	
1865	32,819	131,276	
1866	25,115	100,460	
1867	31,239	124,956	
1868	14,005	176,020	
1869	35,802	143,208	
1870	29,843	119,372	
1871-2-3	148,459	493,836	
1874	81,547 @ 3.00	244,641	
1875	110,145	330,435	
1876	139,192	417,576	
1877	154,052	462,156	
1878	170,846	522,538	— 10000
1879	241,301	723,903	
1880	267,595	802,785	
1881	228,357	685,171	[illegible]
1882	282,139	846,417	
1883	213,299	639,897	
1884	394,070	1,182,210	
1885	265,596	1,096,788	- 30000
1886	326,636	979,908	
1887	413,360	1,240,080	
1888	489,301	1,467,903	
1889	579,830	1,739,490	
1890	678,140	2,034,420	
1891	1,029,097	3,087,291	
1892	826,335	2,479,005	
1893	978,294	2,934,882	
1894	1,012,953	3,038,859	
1695	939,654	2,818,962	
1896	896,222 ~~[illegible]~~	2,327,145	
897	882,854		
Totals	~~11,248,759~~ tons.	~~$33,926,602~~	
1895-6	- Coke -		
~~Coke~~	1,565 tons	$7,825	
1897	17831 @ 5.00	$	

TABLE VIII.

PRODUCTION IN DETAIL OF THE METALLIFEROUS

DISTRICT.	YEAR.	TONS.	GOLD—PLACER.		GOLD—QUARTZ.	
			Ounces.	Value.	Ounces.	Value.
CARIBOO						
Barkerville Division	1895		4,050	81,000		
	1896		4,145	82,900		
Lightning Creek 〃	1895		2,035	40,700		
	1896		2,650	53,000		
Quesnellemouth 〃	1895		910	18,200		
	1896		2,555	51,100		
Keithley Creek 〃	1895		7,125	142,500		
	1896		9,853	197,050		
CASSIAR	1895		1,129	22,575		
	1896		1,050	21,000		
KOOTENAY, EAST	1895		878	17,575		
	1896		1,054	21,076		
KOOTENAY, WEST	1895					
	1896					
Ainsworth Division	1895					
	1896					
Nelson 〃	1895	1,148	275	5,500	1,000	20,000
	1896	30,160	275	5,500	236	4,720
Slocan 〃	1895	9,649			6	120
	1896	16,560 ~~18,215~~			152	3,040
Trail Creek 〃	1895	19,693			31,497	629,940
	1896	38,075			55,275	1,104,500
Other Parts	1895		526	10,520		
	1896	58	231	4,627	35	700
LILLOOET	1895		2,033	40,663		
	1896		1,683	33,665		
YALE	1895					
	1896					
Osoyoos Division	1895		620	12,400	6,767	135,331
	1896				6,561	131,220
*Similakmeen 〃	1895		2,083	41,650		
	1896		450	9,000		
Yale 〃	1895		2,420	48,400		
	1896		3,255	65,108		
TOTALS	1895		24,084	$481,683	39,264	$ 785,491
	1896		27,201	$544,026	62,259	$1,244,180

*Platinum, 1895, $3,800; 1896, $750.

MINES FOR 1895 AND 1896.

Silver.		Copper.		Lead.		Total for Divisions.		Totals for Districts.	
Ounces.	Value.	Pounds.	Value.	Pounds.	Value.	1895	1896	1895	1896
			$		$	$	$	$	$
								282,400	384,050
						81,000			
							82,900		
						40,700			
							53,000		
						18,200			
							51,100		
						142,500			
							197,050		
								22,275	
									21,000
								17,575	
73,790	49,443			2,808,411	83,908				154,427
								2,223,206	4,002,735
263,030	171,759			6,724,000	217,185	388,944			
187,297	125,489			2,151,000	64,100		189,589		
49,750	32,487	112,420	5,621			63,608			
631,960	423,413	2,237,921	111,896				545,529		
1,137,040	742,487			9,751,464	315,070	1,057,677			
~~2,141,088~~	1,434,529			19,210,666	572,479		2,010,048		
46,702	30,496	840,420	42,021			702,457			
89,285	59,830	1,580,635	79,030				1,243,360		
						10,520			
11,917	7,985			29,900	897		14,209		
								40,663	
									33,665
								241,581	206,978
						147,731			
							131,220		
						41,650			
							9,000		
						48,400			
							65,108		
1,496,522	$ 977,229	952,840	$ 47,642	16,475,464	$532,255			$2,828,000	
3,135,343	$2,100,689	3,818 550	$190,926	24,199,977	$721,384				$4,891,955

BUREAU OF MINES.

THE OPERATION OF THE BUREAU OF MINES.

The organisation of the Bureau of Mines, in accordance with the "Bureau of Mines Act," Chap. 3, 1895, was begun in January, 1896, by Wm. A. Carlyle, Ma. E., Provincial Mineralogist, and Herbert Carmichael, Assayer and Chemist, but awaiting the completion of the new Government buildings, in which will be proper rooms for offices, assay and chemical laboratories, and for collections of ores, minerals, rocks, etc., this organisation cannot yet be perfected along those lines it is now proposed to follow. Necessarily a large amount has been done, and yet remains to be done, in arranging the methods of work to be followed in collecting and systematically recording all information pertaining to the mining industry of the Province, which is now assuming such proportions as to attract the attention of capitalists and mining men, who are demanding authoritative statements and statistics concerning these newly opened mineral resources.

It is proposed to—

(*a.*) Ascertain the name and progress of every mine or mining company, keeping a comprehensive directory of their locality, ownership, kind of ore mined and conditions of property:

(*b.*) To visit and examine, from time to time, the different mining districts, and to issue reports to the Hon the Minister of Mines, descriptive of them, and their progress in mining affairs:

(*c.*) To collect full and accurate statistics of the mine, out-put, number of men employed, etc.:

(*d.*) To maintain a laboratory for assay and chemical analysis, for which will be charged the customary fees, and to determine, free of cost, specimens of rock, mineral or ore that may be sent in, and give all possible information concerning the occurrence or probable commercial value of such, with hints concerning the best methods of treatment, etc., etc.

(*e.*) To maintain student laboratories, for instruction in assaying, blow-piping, mineralogy, geology, etc., etc.

(*f.*) To assemble and systematically arrange in a public museum specimens of mineral, ore, country rock, building and other economical mineral materials from the mines; and also, for comparative study, specimens of the same from other mining countries, models, maps, etc.:

(*g.*) To assemble, for the use of the Bureau and also the public, a library of the best reference books and papers relating to the art and industry of mining and metallurgy, mining magazines, reports, tables of statistics, etc.:

(*h.*) To establish and equip a plant for testing, metallurgically, the different kinds of ore, coal, coke, etc., etc.

WORK OF THE YEAR.—BULLETINS.

In January and February a series of lectures was given at Victoria, Vancouver and New Westminster, on ores and ore deposits, chemical and metallurgical subjects by the Provincial Mineralogist, Mr. H. Carmichael and Mr. W. Pellew-Harvey. In the spring the Provincial Mineralogist visited the State Bureau of Mines in San Francisco, where, by the kindness of Mr. J. J. Crawford, State Mineralogist, who is doing excellent and valuable work in his Bureau, the methods of conducting the work incident to an organisation of this kind were studied and much important information gained. Besides issuing the regular reports, Mr. Crawford is having written, by men thoroughly experienced in the subject under discussion, monographs of especial value to every miner and metallurgist, and copies can be got by remitting to him sixty to seventy-five cents for each of these bulletins, that are now highly recommended:—

No. 2.—Mine Timbering, by W. H. Storms.
No. 5.—The Cyanide Process, by Dr. A. Scheidel, E. M.
No. 6.—California's Gold Mill Practices, by Ed. B. Preston, M. E.
No. 9.—Mine Drainage, Pumps, etc., by Hans C. Behr.

On May 28th, the Mineralogist, accompanied by Mr. Carmichael and Dr. Newcombe, left by small steamer for Barclay Sound and the Alberni District, where many points of work were visited, although it was almost too early in the season to examine several parts of the district, to which the trails had not yet been opened through the snow. On return to Victoria *Bulletin No. 1*, on the *Alberni Mining District*, was issued.

Towards the end of June the examination of Rossland Mining Camp was begun, and in August was published *Bulletin No 2*, on the *Trail Creek District*, a report to which the writer could have done much more justice, both to the district and to himself, by taking more time in its compilation, only it was thought that as great interest had been aroused, and many were being attracted to this new gold field, that a prompt report, even if not so long and more detailed, would prove more serviceable by supplying official information just when the demand for such was urgent.

After visiting Rossland, the Slocan, Nelson and Ainsworth Districts were examined as far as time would permit, the object aimed at being to obtain as wide an acquaintance as possible concerning the general conditions of the mining industry, ore bodies, shipping facilities, etc., and data gained has recently been published in *Bulletin No. 3*, on the *Slocan, Nelson and Ainsworth Districts.*

A short visit was paid East Kootenay, a district of great promise, that this year will attract much wide interest by the reason of the discovery of fine bodies of silver and silver-lead ores and of large gold-bearing quartz ledges, and a large influx of mining men and prospectors is now promised, like that of the early days in the sixties, when thousands of men were working along the gold placer diggings of Wild Horse, Perry and other creeks. A short account of this district is embodied in this Annual Report and also the three bulletins mentioned, and important reports from the other districts in the Province, by the Gold Commissioners and Mining Recorders.

LIBRARY.

The foundation of an excellent library has been laid by the purchase of some of the best books on mining, metallurgy, geology, mineralogy, etc., all of which are at the disposal of those who may wish to come and consult them, but cannot, however, be taken away from the building. Among these books are:—

Transactions of American Institute of Mining Engineers (complete series).
The Mineral Industry (complete series).
Mining, Iron and Steel.
Mining and Ore Dressing Machinery (Lock).
Practical Gold Mining (Lock).
Text Book of Ore and Stone Mining (Le Neve Foster).
Modern Copper Smelting (Peters).
Metallurgy of Lead (Hoffman).
Matte Smelting (Lang).
Ore Deposits of the United States (Kemp).
The art of Ore Dressing in Europe (Kunhardt).
System of Mineralogy (Dana).
Geology (Dana).
Geology (Sir Wm. Dawson).
Geology (Shaler).
Ore Deposits (Phillips).
Geological Survey of Canada (complete).
Reports and Bulletins, Bureau of Mines, California.
Smithsonian Institute Reports.
Mining Reports of New Zealand.
Arkansas Geological Survey.
Mineral Resources of the United States (Chas. D. Wolcott).
Reports of the Bureau of Mines, Ontario.
Reports of the Inspector of Mines, Nova Scotia.
Reports of the Commissioner of Mines, Colorado.
etc. etc. etc.

Among the periodicals taken are the Engineering and Mining Journal (New York), the Mining and Scientific Press (San Francisco), the Canadian Mining Review, the B. C. Mining Record, the Western Mining World, the Canadian Engineer, Mining, Etc., and shortly other books and mining magazines will be added to this nucleus of excellent publications.

The many thanks of this Department are due to the Geological Survey of Canada, the Director of the Bureau of Mines, Ontario; the Inspector of Mines of Nova Scotia, the State Mineralogist of California, the Director of the Geological Survey of the United States, the Director of the Geological Survey of Arkansas, Hon. Henry M. Teller, Senator for Colorado; the Commissioner of Mines of Colorado, the Minister of Mines of New Zealand, and others, who have kindly forwarded copies of their reports, etc , to this Bureau.

THE ASSAY OFFICE.

This office has been removed, *pro tem.*, to the old printing building, but when finally installed in the proper quarters will be thoroughly equipped with all the best appliances for rapid and accurate work. If not brought in too late an endeavour is always made to give the assay results on the same day the samples are sent in for assay, and all assaying is charged for by Order in Council, after the following schedule of prices:—

BUREAU OF MINES, 1st July, 1896.

The following are the fees charged in the Government Assay Office, Victoria, for mineral assays, and for the future all applications for assays—no matter from what quarter they may come—must be accompanied by the cash for the fee, otherwise the Government Assayer has strict orders not to perform the assay:—

Gold and silver	$ 1 50
Lead	1 50
Copper	3 00
Iron	3 00
Mercury	5 00
Tin	5 00
Antimony	5 00
Zinc	5 00
Nickel, qualitative assay	5 00
Nickel, quantitative assay	10 00
Cobalt, qualitative assay	5 00
Cobalt, quantitative assay	10 00
Chromium, qualitative assay	5 00
Chromium, quantitative assay	10 00

JAMES BAKER,
Minister of Mines.

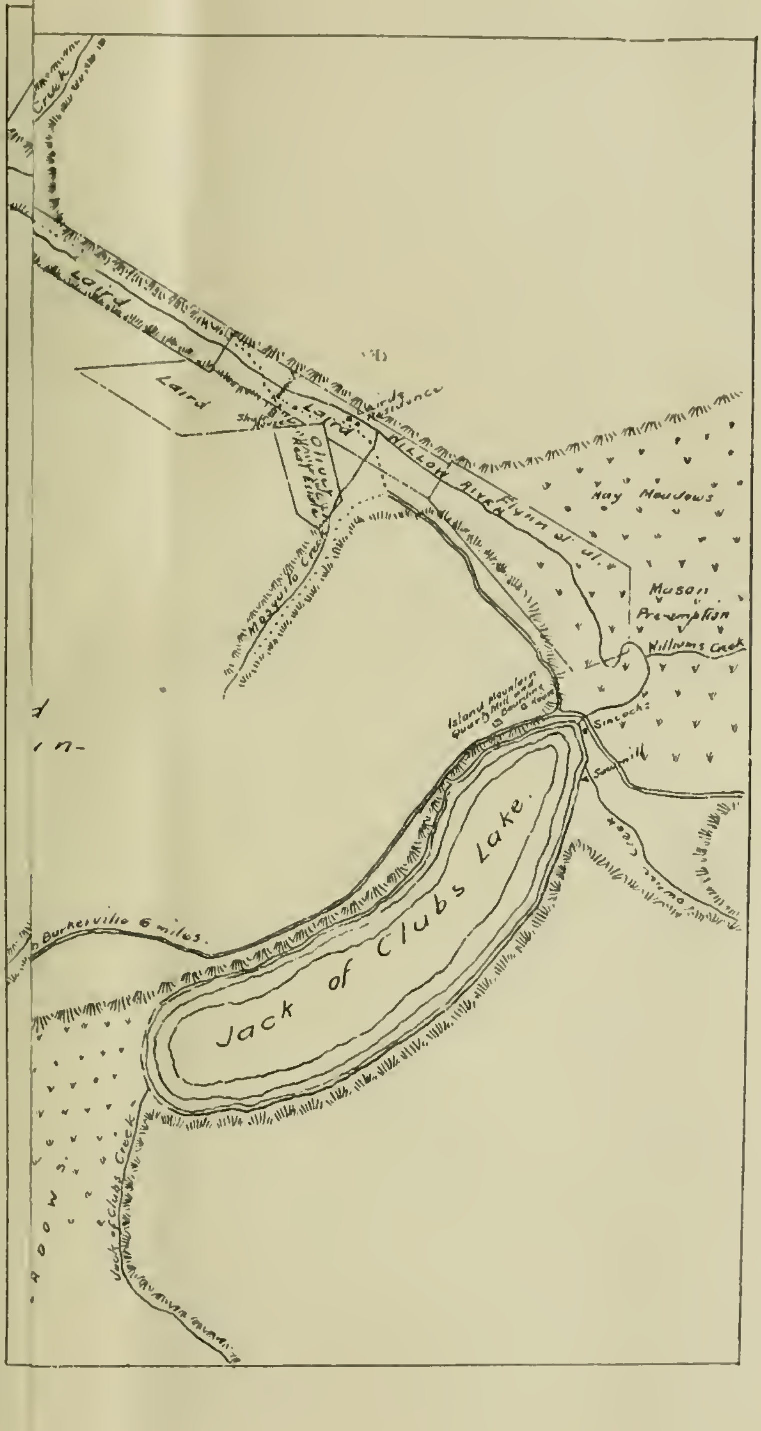
Mr. Carmichael is not only performing his duties as assayer most satisfactorily, as is attested in one way by the large increase in the revenue for 1896 from assay fees, but is showing much zeal in, and doing every endeavour to forward the work of this Bureau, with which he has been intimately connected since its inception.

MINERAL COLLECTION.

During the past season a large collection was made of ores, minerals and rocks, which will be properly arranged when the Mineral Museum is ready for occupancy, and valuable collections have been promised from Butte, Mont., the Cœur d'Alene Mines, California, Colorado and elsewhere, and with the collections now in the Provincial Museum a very interesting and needed museum will be connected with this Bureau.

STATISTICS.

By consulting all the authorities available, from reports of the Government officers, and by the collection of smelter and customs returns by this Bureau, a comprehensive statement of the mineral production of British Columbia is given in the opening pages of this report, and from this time on it is intended to issue regular reports, at present half-yearly if possible. The data concerning the production of the economical mine products, as building stone, bricks, etc., will also be collected, and thus increase the totals that are being yearly augmented rapidly.


Creek
Laird
Laird
Laird
Lairds Residence
Oliver & Cunningham Half Estate
Willow River
Flynn & al.
Mosquito Creek
Hay Meadows
Mason Preemption
Williams Creek
Island Mountain Quartz Mill and Boarding House
Simcock's
Sawmill
Creek
To Barkerville 6 miles.
Jack of Clubs Lake.
Jack of Clubs Creek
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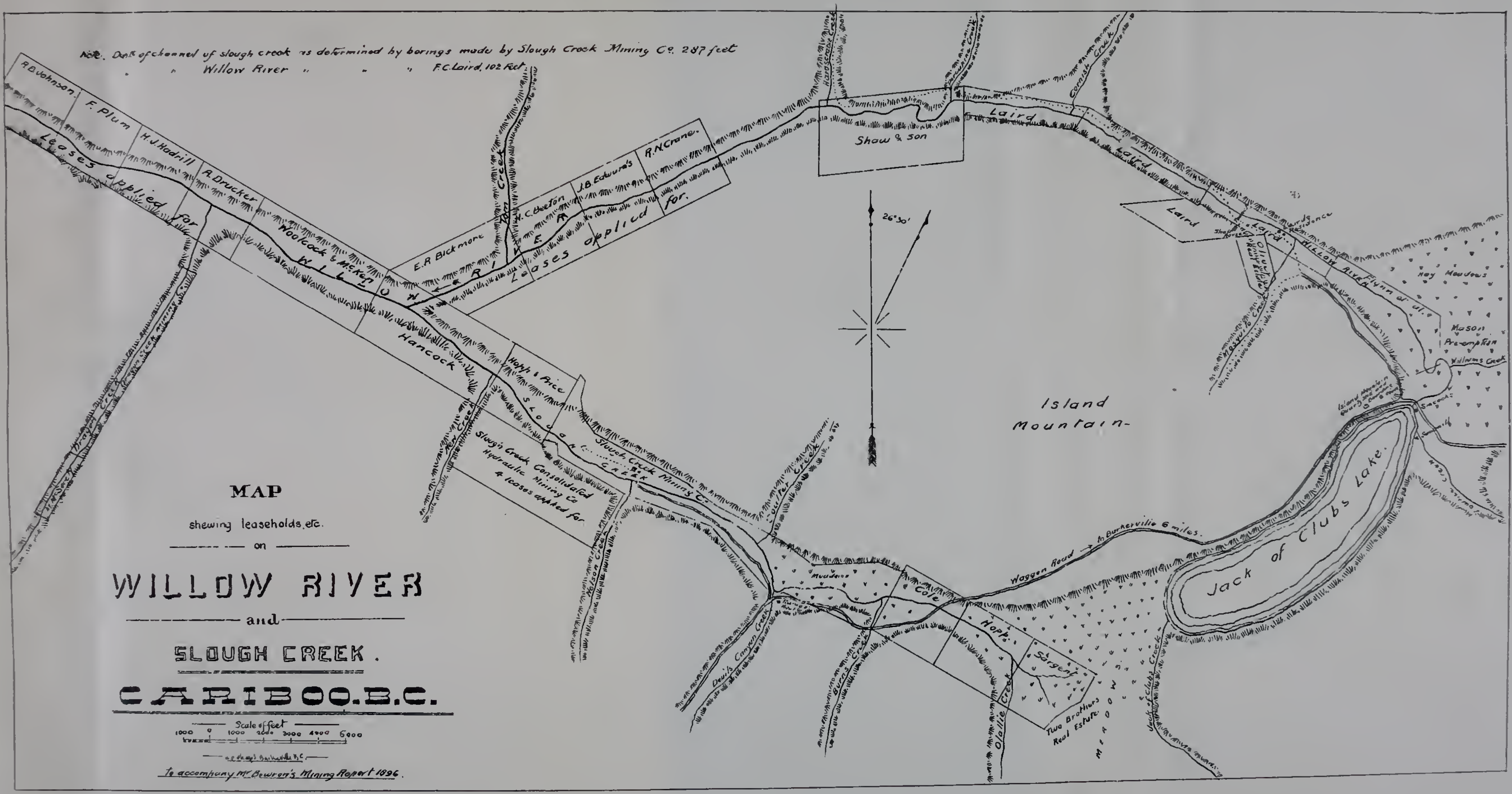

MAP
shewing leaseholds, etc.
on
WILLOW RIVER
and
SLOUGH CREEK.
CARIBOO.B.C.
Scale of feet
1000 0 1000 2000 3000 4000 5000
To accompany Mr Bewron's Mining Report 1896.
Note. Depth of channel of slough creek as determined by borings made by Slough Creek Mining Co. 287 feet
" Willow River " " " F.C.Laird, 102 Feet.
A.D.Johnson.
F. Plum
H.J. Hadrill
A. Drucker
Woolcock & McKen
Leases applied for
WILLOW RIVER
E.R. Bickmore
H.C. Beeton
J.B. Edwards
R.N.Crane.
Leases applied for.
Hancock
Hopp & Price
SLOUGH CREEK
Slough Creek Mining Co.
Slough Creek Consolidated Hydraulic Mining Co
4 leases applied for
Nelson Creek
Holson Creek
Coulter Creek
Shaw & son
Laird
Laird
Laird
Laird
Cornish Creek
Laird's Residence
Willow River
Flynn et al.
Hay Meadows
Mason Pre-emption
Williams Creek
Mosquito Creek
26°30'
Island Mountain
Jack of Clubs Lake.
Waggon Road → to Barkerville 6 miles.
Meadows
Cole
Hopp.
Sargent
Two Brothers Real Estate
MEADOW
Devil's Canyon Creek
Burns Creek
Olallie Creek
Jack of Clubs Creek

Lode Mining.

We desire to emphasise strongly the fact that lode mining in this Province has but just begun, that in reality it has assumed important proportions only during the last four years, and the figures given above will clearly indicate the rapid progress now being made, with every promise that this class of mining, now firmly established, the latent mineral resources so long untouched and unknown will prove one of the most profitable and important industries in this Province.

Acknowledgments.

Much appreciation must be expressed of the great interest in the mining industry, as shown by the Hon. the Minister of Mines, and for his efforts to aid its progress as far as lay in his power; also many thanks are due Mr. Tom Kains, Surveyor-General, for his valuable assistance in the prompt preparation of maps, etc., for the reports, and to Col. R. Wolfenden, Queen's Printer, for the careful editing and the issue of bulletins and reports with utmost dispatch.

EXPLOSIVES AND CHEMICALS.

The demand for dynamite powder and black powder, especially the former, is keeping pace with the progress of mining, and in three establishments in the Province are explosives being manufactured for mining purposes. Of the dynamite powder, commonly known as giant, the two grades, No. 1 and No. 2, are manufactured and shipped by the usual means of carriage to the mine centres. Two of the largest companies have branch establishments on the Island of Vancouver, of which—

The Hamilton Powder Co., of Montreal, have works at Northfield, near Nanaimo.

The Giant Powder Co., of San Francisco, Cal., manufactures near Cadboro Bay, a few miles from Victoria.

A third and small plant is making dynamite powder near Balfour, near the entrance to the West Arm of Kootenay Lake.

At Victoria all the commercial acids are being made at the Victoria Chemical Works, near the outer wharf, such as sulphuric, nitric and hydrochloric, and if metallurgical processes are introduced into the Province, such as chlorination plants, all chemical supplies such as acids, bleaching powder, etc., will be procurable from this manufactory at the lowest market prices. This firm supplies all acids to the powder manufacturers.

CARIBOO.

By Mr. John Bowron, Gold Commissioner.

Sir,—I have the honour to submit herewith for your information the 22nd annual report on the mining industry in Cariboo District, accompanied by the customary statistical information.

Both placer and quartz mining have received more than the usual attention during the past season.

The principal sources of the gold supply at the present time are the hydraulic claims, the profitable working of which depends on the amount of water supply obtainable under pressure. This season being the driest ever known, those claims that secured a few weeks' run only were deemed fortunate, while many of the regular producers were unable to clean up at all, hence the comparatively light increase in the product, considering the number of men engaged, as compared with other years. A large majority of those employed were engaged in development work on both placer and quartz claims.

Hydraulic Mines.

The hydraulic claims on Mosquito Creek and the Black Jack hydraulic claim on Williams Creek have contributed their usual quota to the general output, but the Forest Rose claim on Williams Creek, for the reasons mentioned above, was unable to make a clean up.

The Waverley claim on Grouse Creek, which has so long disappointed its shareholders, was enabled to make a clean up on bedrock for the first time this season, and as a result a dividend of $1.00 per share was declared. This claim will doubtless pay dividends for the next thirty years.

On Dragon Creek, a tributary of Willow River, a Seattle company which has acquired two hydraulic leases has, under the management of Mr. Gust. Lange, been pushing ahead the preparatory work with vigor, and will be in readiness to take advantage of the spring freshet. This is a very promising mine.

Mr. Seymour Baker, of London, representing an English syndicate, has acquired by purchase a group of hydraulic leases situated on the east bank of the Fraser, below the mouth of the Cottonwood River.

Preparations have been made during the season to operate these claims next summer. A large ditch about fifteen miles in length is being constructed, upon which work will be continued during the winter, and it is proposed to have the hydraulic plant placed upon the ground in the early spring. I have not had an opportunity to visit this mine, but I understand the prospects obtained warrant the belief that it will soon become a valuable property.

The Marquette and Menominee Hydraulic Mining Co., of Michigan, having purchased the rights of a Chinese company operating on Cunningham Creek, which has hitherto been worked to much disadvantage, owing to the indifferent nature of the appliances used, have made surveys for a ditch, and acquired adequate water rights, and will place on the ground a large hydraulic plant in time for next season's use.

The Cariboo Mining and Development Co, of Seattle, having acquired a group of leases on the left bank of Antler Creek, have during the season constructed a large ditch to bring water on to their claims, which they believe to be a blind channel of Antler Creek, which view appears to be justified from the prospects obtained from ground-sluicing before cold weather set in. This company will also put on a plant during the winter to be ready for operations in the spring.

In addition to the companies named there are a number of strong syndicates formed to operate hydraulic claims on Lightning, Williams, Slough, Antler and Cunningham Creeks, to say nothing of the extensive works undertaken or companies formed to work the gravel deposits on the Quesnelle River and at Horsetly, on which Mining Recorder Stephenson will report. We, therefore, confidently predict for the season of 1897 unusual activity throughout the district in the development of our placer mines.

Creek Diggings.

On Willow River, Mr. F. C. Laird is nobly fighting against adverse circumstances in his endeavour to reach the deep channel in his claim. A shaft has been sunk 100 feet through gravel and 105 feet through bedrock, and a drive is now being run some 600 feet to tap the channel. Mr. Laird's report on his work will be found appended hereto.

The Slough Creek Mining Co., of Slough Creek, are also persevering with their work. After having been beaten in their attempt to sink a working shaft through the gravel and slum, they decided to continue their drain tunnel on towards the mouth of Nelson Creek until bedrock is reached, and then sink in rock and drift out into the channel. In running the drain tunnel they have experienced much difficulty from the quantity of slum, water and large boulders encountered, which necessitated the running of a "balloon" drive to cut off the surface water. The work is now progressing favourably, and Mr. Sargent, the secretary of the company, has promised a report upon the same, which, if received, will be appended hereto.

As the ground owned by the last two companies mentioned, and the territory lying between and adjacent thereto, will doubtless attract much attention in the future, I have caused a map to be prepared to accompany this report showing the position of the various leaseholds.

The Big Valley Creek Gold Mines, Ld., holds a group of four claims on Big Valley and Two Bit Creeks. Development work has been prosecuted since June last under the superintendence of Mr. W. Adams, M.P.P. A tunnel of somewhat over 700 feet in length has been run, but bedrock in the channel has not yet been reached. Wherever rim rock was encountered in running the tunnel heavy gold was found, leading to the belief that when the bottom of the channel is reached a valuable mine will be developed. This company has recently completed an incline, run down near the face of the drive, which will facilitate the disposal of the dirt. Work will be prosecuted during the winter.

Big Valley Creek is situate about fifteen miles north-east of Barkerville, the surface of which was worked to a limited extent in the early sixties, paying about wages, which at that time were from $8 to $10 per day, but the bottom of the deep channel was never reached. This company has also sunk a shaft on the side hill to a depth of eighty feet to test the value of the ground as a hydraulic proposition, but as yet bedrock has not been reached.

On the Urquhart claim, just above Dunbar Flat, on Lightning Creek, good prospects of very coarse gold were obtained. The owner, Mr. Walter Urquhart, feels confident that he has discovered a spill from the Dunbar lead, and that he has nearly a thousand feet of it. He is prepared for carrying on work during the winter, and expects to be taking out pay dirt shortly.

In the South Wales leasehold, comprising the Old Spruce, South Wales, Lightning and Ross claims, a good strike has been made on a bench about ten feet higher than the old worked channel, and between it and the lower end of the Butcher bench. The owners, Messrs. Jones, Tregillus and Price, have expended an immense amount of labour in reaching this ground, the existence of which had been proved before by a party of prospectors, who had the misfortune to lose their shaft and block the drainage before they were fairly on the bench, and after several ineffectual attempts to open it again were forced to give it up. The present company took up the ground in 1890, and have worked it continuously ever since. It is impossible to state the exact extent of this bench, but from surface indications it is nearly 100 feet wide, and may be from 400 to 1,000 feet in length, and as it lies between ground that yielded richly in the past, and is paying now, there is reason to believe that this is a valuable property.

The sale for taxes of the three real estate claims adjoining the upper line of the old Eleven of England Claim, has made possible the amalgamation of the Water Lily, Amalgamated and Bay State with the Eleven of England leasehold under one company, known as the Consolidated Eleven of England Company. This is a very good property, and its development will give a decided impetus to the mining industry on Lightning Creek.

It is to be regretted that the Lightning Creek Mining Co. and the Antler Creek Mining Co, who acquired last season what are regarded as valuable properties on Lightning and Antler Creeks, respectively, and who hold by Acts of the Legislature special privileges, have not yet commenced work upon their holdings, although several well-known men of experience have reported thereon. It is hoped that these companies will be in a position to commence active operations shortly.

Hydraulic Elevator.

On Williams Creek the Cariboo Gold Fields, Ld., have continued to prosecute their extensive works with vigor. Bad ground was encountered in the drain tunnel, which is intended to reach and drain the works, being over half a mile in length. They were compelled to suspend work during the spring freshet, thus causing some three or four months' delay before the water drained off sufficiently to allow work to be resumed. Fair headway is now being made. This company has met with serious drawback in getting its heavy iron pipe hauled from Ashcroft and placed on the ground, the freight rates being almost prohibitive. With its usual perseverance, however, a contract has been recently let for the transportation of the pipe, and, the road permitting, a large quantity will be brought in during the winter. This is but one instance of the difficulties to be encountered in the development of a mining camp 300 miles from a railway or other good means of communication. Mr. Champion, the present manager of the company, has kindly consented to furnish a report on the work, which I append hereto.

New Mines.

It is satisfactory to note that there is a disposition shown among some of the new arrivals in Cariboo to leave the beaten track of the old prospector. Half a dozen applications are just to hand for leases on a small creek, called Lake Creek, described as being 30 miles north of Cottonwood River. The demand for leases still continues, some 250 having been applied for during the season.

Some recent discoveries have been made, of the extent and importance of which it would at present be premature to judge, but that they will be contributors to the gold yield of the district in the future is a fact that cannot be gainsaid.

The first I will refer to is a discovery made by Messrs. Wendle, Campbell & Co., on Pleasant Valley Creek, on the east side of Valley Mountain. This party, working only 25 feet square of ground to bedrock, the depth being from 15 to 20 feet, took out about $1,000. When their water supply was exhausted they at once started to bring in a ditch some two miles in length, which was completed too late to be of service this season. The company is now engaged in running a tunnel, and as soon as water can be obtained in the spring they will doubtless do well. All the ground adjoining this claim has been located, on which prospecting is now going on.

Messrs. Isaac, Johnson, Cockell and Walker have been running a tunnel through bedrock on Stewart's Creek, a tributary of Big Valley Creek, about 3 miles above the Big Valley Creek Gold Mining Co.'s work. The distance run is about 500 feet, which brought them into the channel, and they were rewarded by finding excellent pay gravel, as high as $2 to the pan being obtained. But for the scarcity of water the company would be taking out good pay from now on, being well situated for working during winter. All the adjoining ground has been located and is now being prospected.

Parties prospecting on Bear River, 16 miles to the north-east of Barkerville, report finding diggings that will pay $4 per day to shovel into sluices. This ground is very extensive, and with the necessary water supply and improved appliances can be made to pay handsome dividends.

RIVER DREDGING.

This branch of our mining industry may be said to be still in the experimental stage. Three scows, fitted with powerful machinery, were constructed at Quesnellemouth during last winter and spring, all of the suction type, although differing somewhat in the machinery used. The first put in operation was that constructed under the superintendence of Mr. Underwood, of Chicago, to operate on the lower part of the Quesnelle River. When put in operation it was found that although the heavy machinery (two 75 h. p. engines) did its work perfectly, much difficulty was experienced in keeping the screen at the mouth of the pipe clear, owing to the presence of numerous small boulders, thus preventing the auriferous gravel from being brought up into the sluices. The presence of gold in paying quantities when worked under favourable conditions was proven, and it is understood that the company proposes to put in either a bucket or dipper dredge at once.

The Youngs dredge, built to operate on the Pittsburg and Cariboo Gold Dredging Co.'s leases at Cottonwood Canyon, on the Fraser River, after experiencing the usual mishaps incident to new undertakings in remote localities, and anticipating the difficulty experienced by the Underwood dredge, made use of an appliance for removing such rocks as were sucked up against the grating at the end of the suction pipe. For some days the dredge did good work, bringing up some coarse gold, but as it was not found to be in paying quantities the dredge was removed to another place, which gave very satisfactory returns until their pump burst, leaving them powerless to continue the work. Mr. Youngs, who was in charge of the work, informs me that $60 in coarse gold was obtained from the last eight hours' operation. Work will be resumed by this company in the early spring.

The Alexandria Dredging Co., whose holdings are on the Fraser River, below Quesnellemouth, constructed, under the management of Mr. McCaskell, a suction dredge of somewhat lesser capacity than the two former, which commenced operations about three miles below the mouth of the Quesnelle River, and is said to have paid more than wages. As it was quite late in the fall before the dredge was started, only two or three weeks' run was made before the cold weather set in. The best evidence that this dredge at least is not a failure is the receipt of the royalty on the gold won from Mr. Heimick, of Vancouver, the secretary of the company. This is the first revenue of the kind paid into this office.

QUARTZ.

Very much interest has been engendered in our quartz mines during the season, presumably in consequence of the proof that our ores are adapted to the cyanide process of treatment, which Mr Marsh claims that he has demonstrated beyond question. Be this as it may, never before has so much confidence been manifested in our ledges as is evidenced in the unusual arge number of locations made.

Messrs. Thompson & Marsh, the lessees of the Government Reduction Works, are entitled to much credit for the push and energy displayed in carrying out the undertaking of placing a cyanide plant in the works. These gentlemen are the holders of an option on the Black Jack mine near Barkerville, on which they have expended a large sum of money in putting it in proper shape for working, and although they have at present suspended operations I understand this is but temporary.

Mr. Tatlow, of Vancouver, has bonded the Wintrip real estate claim, and is now engaged in running a tunnel on one of the ledges. This property, which contains three distinct ledges, adjoins the Black Jack mine, and is regarded as a most valuable proposition.

Two claims on Burns' Mountain have been bonded and first payments made, and it is expected that a large amount of development work will be done on these and several other locations in the vicinity next season.

As the years roll on the necessity for preserving, in a permanent form, some authentic record of the amounts produced from the famous gold-bearing creeks of the district becomes more manifest. I have therefore had prepared to accompany this report a map of Williams Creek, showing the present locations as well as the position of all the old claims of the early days, accompanied by a table stating the amount of gold produced from each particular locality, from the early days to the present time.

In the compilation of the table accompanying this map I am indebted for information to nearly all the old miners now resident in the district, and would especially mention the names of Capt. G. W. Robinson, and Messrs. H. McDermott, W. Hodgkinson, Wm. F. Anderson and Harry Jones.

The estimated gold product for the year is as follows:—

Barkerville Polling Division	$ 78,900
Lightning Creek "	50,000
Quesnelle "	48,100
Keithley, Quesnelle Forks and Horsefly	200,000
Estimated product from 1st to 31st December, including desultory mining, of which no account could be obtained	10,000
Total	$387,000

WILLOW RIVER LEASE.

By Mr. Fred. C. Laird, Manager.

In giving a report of the work done on this claim for the past year I beg to state as follows:—

When I made my last report to you we had finished our tunnel to rim rock, and had built a small shaft house to sink a shaft from the surface of the ground to the rim rock, connecting with the tunnel. Last winter we completed the shaft, making it six by twelve feet in the clear, and in three compartments. The shaft to rim rock is just 100 feet deep. Early last spring we began to grade out the hillside, in order to place our large shaft house and machinery, and get the machinery up the hill. Three months were spent in grading, building a tramway seven hundred feet up the hill, and hauling up the machinery by steam power. After getting buildings and machinery in shape we continued our shaft 112 feet deeper through the rock.

Leaving the last twelve feet of this shaft for a sump we broke out early in November into the tunnel, through which we expect to reach the channel of Willow River. We are now working day and night at this tunnel, and are progressing at the rate of 100 feet a month. The tunnel is six by five feet in the clear, and will be about 600 feet long when completed. We are now 160 feet in the tunnel. We use an Ingersoll-Sergeant drill and a blasting battery. We have had as usual many difficulties to surmount. The rock has been most difficult to work on account of its softness. All of the tunnel has to be timbered, and a great deal of extra work has been caused by rock caving.

Our plant now consists of main shaft house, 15 x 25 feet, boiler house 30 x 20 feet, and blacksmith shop 12 x 18 feet. Our other buildings consist of seven houses, stables and powder house.

Machinery comprises a fifty-horse power boiler, a pair of thirty-five-horse power engines, one 18-inch Cornish pump, two 12-inch Cornish pumps, one horizontal steam pump, a sixteen-horse power hoisting engine with upright boiler, besides the rock drill already referred to, and tools of all kinds.

We are thoroughly equipped to push the work, and barring unforseen accidents we confidently expect to reach the channel of Willow River by March 15th next.

From the surface of the ground to bedrock in the channel, as determined by the borings, it is 100 feet. In order to reach the channel, however, we have had to run a tunnel into the hill 620 feet long, sink a shaft to the rim 100 feet deep, continue the shaft 112 feet in rock. and then run a tunnel in the rock about 600 feet long, making in all nearly 1,500 feet of work.

SLOUGH CREEK MINING CO.

FROM MR. W. H. FIFE, PRESIDENT.

The work of development upon the property of the Slough Creek Mining Company has been continuously prosecuted during the entire year, but owing to the open winter season last past progress was slow during the early part of the year. Development work has been confined principally to the running of drainage tunnels, for the double purpose of draining the surface water from the high rock at the mouth of Nelson Creek, that it may be worked for its gold, and for the further purpose of draining the water so that we may proceed with the sinking of our proposed bedrock shaft and drive out to the old channel. The character of the ground through which we have been running the tunnels has been that of a loose wash, with large boulders throughout the entire distance and filled with surface water.

In order to complete the work of running the lateral extension of the main drain tunnel it was found necessary to open for its entire length, about 700 feet, an old abandoned drainage tunnel run by Nelson Creek miners many years ago, which in caving had not only drawn the surface water to it, since its abandonment, but had allowed water to accumulate as in a reservoir. This was a laborious undertaking and occupied much time, but it has been of great benefit. It was further found necessary to run a "balloon" drive between the lower tunnel and the old Nelson Creek tunnel referred to. As a result of these two undertakings the lower tunnel is nearly free from water, and the work of continuing it to the bedrock is progressing favourably, and so soon as the rock has been reached it is our intention to begin the construction, at once, of a working bedrock shaft to the old channel.

QUARTZ MINING—EXPERIMENTS WITH CYANIDE PROCESS.

BY S. J. MARSH, M.E., BARKERVILLE.

In giving a resume of quartz mining so far as it has come to my notice during the past summer, I may say that prospectors have been particularly active in looking for and locating quartz claims. Development work has been performed to the extent of $100 or more on a large number of claims, and on several a large amount has been expended. The results are most encouraging. In many instances large bodies of ore have been uncovered, and in no case that has come under my notice has bonâ fide work failed to show most beneficial results.

Many important facts have been demonstrated by this work, a few of which are:—

(1.) The limestone bands are closely related as to their position to the larger and well defined veins:

(2.) The country rock (slate) in the vicinity of richer portions of large veins, is mineralized with pyrite, and carries gold in varying quantities:

(3.) There are large bands of siliceous slates carrying gold, sometimes in paying quantities:

(4.) Free gold exists in all decomposed ores and siliceous slates, while very little, if any, exists in ores where decomposition has not taken place to some extent:

(5.) As depth is obtained the veins show less faulting and better defined walls.

Some of these facts are of great importance, and will be of value to the prospector who carefully studies the condition of the country, as well as to those who may wish to go more deeply into the nature and origin of the deposits of placer gold in this district.

In regard to practical reduction tests, as you are aware, a most complete test plant, using the McArthur-Forrest cyanide process, has been added to the Reduction Works, and the same put in first-class condition.

Since 17th August 265 tons of ore have been treated by the above-named process, and while I am not at liberty to give the exact figures I may say that the results obtained have been most satisfactory.

In this connection much important data has been gained, and the cyanide process has been placed on a solid basis here, and its scope of usefulness determined.

One fact, however, should be mentioned in regard to treatment by cyanide, lest it be regarded as a "cure all."

The heavier sulphides here, as in other places, have not as yet yielded to it except to a small degree. Finer crushing and agitation, with perhaps some modification of the present process, may overcome the difficulty, and while this will require some more experimental work, the fact is established beyond doubt that these sulphides, which may be easily separated by concentration, and which compose but a small part of the weight of the ores, may be successfully treated by chlorination, while the tailings and slimes will readily give up their gold to cyanide.

A concentrating plant will be added to the works this winter, also a small chlorination test plant, and a small cyanide plant to treat black sand from placers, which has been successfully treated during the summer.

From data carefully collected and estimates made, I may say that the average ore can be treated on a basis of fifty tons per day, by the combination of the two processes above referred to, for $2.98 per ton, exclusive of mining and royalty.

Of the work laid out for next season I am not at liberty to speak. I may assure you, however, that a large amount of important work will be done.

The assurance of a railway would give more impetus just now than anything else to the development of quartz mines, as eventually a large amount of machinery must be got here, which at the present freight rates would be very expensive.

CARIBOO GOLD FIELDS CO.

By James Champion, M. E., Superintendent.

As a statement of work done on the Cariboo Gold Fields, Limited, during the past year I beg to report as follows:—

Since the last yearly report the drain tunnel (owing to very bad ground) has been driven only 800 feet, making the total length excavated to date 2,100 feet, leaving about 500 feet more to be driven to strike bedrock.

The No. 5 shaft has been sunk and connected with the tunnel at a perpendicular depth of 13 feet. On this shaft we have built a shaft-house 50 feet long, 25 feet wide, and 20 feet high, and have erected a steam-engine to hoist the gravel, which is washed in a "dump-box" as it is taken from the tunnel. We clean up the dump-box on the first day of each month, and I am pleased to state that our "clean-ups" have been very encouraging.

New blocks have been put in the Williams Creek flume, which is 2,200 feet long, 14 feet wide, and 6 feet deep; we have also put in a partition in the centre of said flume for the convenience of repairing at low water, when we can turn all the water of the creek in one compartment while we are repairing the other. Each compartment is 6 feet 7½ inches wide by 6 feet deep in the clear.

The ditch from Jack of Clubs Creek to Lightning Creek is completed, and we are now running water through the ditches from Lightning to Williams Creek, a distance of seven miles.

The ditch from Williams Creek to a point opposite proposed elevator shaft is also completed; length of ditch, three-quarter mile.

The Eye Opener ditch has been cleaned out and enlarged the whole length of the ditch.

The clean-up from the Eye Opener claim this season was so satisfactory that we have put in place ready for next season a new monitor having 4 and 5-inch nozzles, and 1,800 feet of 12-inch pipe, which will give a pressure of 350 feet. This monitor will be worked in conjunction with the old one.

Mr. S. Tingley has taken a contract from the company to deliver all the elevator pipe from Ashcroft to Quesnelle; about 100 tons has been delivered. The balance of about 300 tons is at Soda Creek, and will be delivered at Quesnelle, according to contract, by the first of March. The company's teams are now hauling the pipe that has been delivered at Quesnelle to this place, and we expect to get all the pipe delivered at Barkerville by the first of August next, and have the pipe and elevators in place ready to work before the end of next season.

OPERATIONS OF THE PITTSBURG AND CARIBOO GOLD DREDGING CO.

By F. E. Young, General Manager.

The Pittsburg and Cariboo Gold Dredging Co. was incorporated in West Virginia June 3rd, 1895, with an authorised capital of $200,000, the stock being taken by Pittsburg, Pennsylvania, capitalists.

A new form of suction dredging machinery, patented by the writer in Canada, November 15th, 1895, was adopted and built during the following winter and spring, and commenced active dredging operations in the Fraser River at Quesnelle in July, 1896. Only traces of gold were found at that point, and the plant was soon removed to the lease of the company above the mouth of the Cottonwood River, at the foot of Cottonwood Canyon, which was then prospected thoroughly, little or no gold being found on the bars for the first 1½ miles, above which the canyon narrows to about 400 feet and the water becomes very deep, the bottom having practically no gravel on the bedrock, which is every where exposed.

In this deep water, in the crevices of the bedrock, coarse heavy gold was found in pieces running as heavy as 84 cents, with many from 25 cents upwards, and in quantities sufficient to pay well had the dredge been operated continuously there. A few days after this pay was found the main shell of the centrifugal pump was broken, suspending operations for the season, it then being late in October.

The end of the suction pipe of this dredger is provided with a chisel or plow blade adapted to loosen up the gravel on the bed of the river, or to disintegrate and break up the surface of the bedrock bottom so as to free the gold lodged in the crevices, which is then easily lifted by the pump. The dredger is essentially a steam propelled scow, 26 feet by 80 feet, on the bow of which is placed a turntable carrying an 8-inch sand dredging pump, with steel suction pipe and connections, and a double drum hoisting engine, connected so as to rotate the turntable through an arc of 180°, and adapted to handle the steel suction pipe and plowing device so as to loosen up the gravel and break up the surface of the bedrock on the bottom of the river. The stroke of the plow ended, suction pipe is, to and from the turntable, radially a distance of about 25 or 30 feet, thus covering a very large area of the river bed without having to move the boat.

The results of the first season's work, while not financially satisfactory, are of great value from the knowledge gained of this branch of mining. They prove, *first*, that much of the river bed contains so little gold as to be no value for dredging.

Second—Bars which carry good pay above low water mark often carry little or no gold below it.

Third—Coarse gold once deposited in deep water in the bed of the river practically never travels.

Fourth—Pay streaks found on the bed of the river are often as sharply defined as if found in a vein of quartz. A few feet below where good pay is obtained not a trace of gold will be found.

Fifth—No form of dredger yet devised can be expected to give good results under all the differing conditions found on the Fraser River.

Sixth—Where the gold lies on bare bedrock, or but slightly covered with gravel, a suction dredge is far superior to any other form.

Seventh—Where the gold is fine and distributed through deep bodies of gravel a good form of dipper or bucket dredge is preferable, but the bottom should be afterwards worked over with a suction dredge to clean the bedrock.

Eighth—Below low water mark the gravel rarely exceeds six feet in depth over the bedrock or clay, and averages less than two feet.

Ninth—The location of valuable pay streaks in the bed of the rivers can only be done by systematically prospecting every portion of the stream by means of a small steam dredger, after which machines of large capacity properly designed to meet the conditions where the pay is found can be made to yield large returns, and bring this branch of mining to the front as one of the best paying propositions in the country.

KEITHLEY DIVISION.

By Mr. W. Stephenson, Mining Recorder.

Sir,—I have the honour to inclose herewith the estimate yield of gold for 1896 of the Keithley Division of Cariboo District, which if not fully coming up to our expectations at least shows a considerable increase over last year, which taken into consideration with a very poor mining season, owing to the want of rain experienced all over Cariboo District, gives a very fair showing for this section. Development work in this section has not been pushed to the extent that I expected it would have been during this last season, in some cases the want of water expected to be obtained from small streams to be used in prospecting has been the cause, and in other cases the cause is not very apparent; but as a whole there has been a considerable amount of preliminary work done, also quite a number of new locations made, which promises well for the coming season's work. Even at the present time there is work for all those who wish to work, as the Golden River Quesnelle Company are employing all the men they can get on their dam works at the outlet of Quesnelle Lake. This Company, since they commenced operations, have been pushing their work as fast as men and money can make it go.

In the way of new developments there is little to report except in the case of one company, the "California Consolidated," holding three mining leases on Roses Gulch. This company, with a limited supply of water, has opened up a cut in their ground, obtaining good results for the work done, and there is little doubt that with a good water supply would have a valuable mine.

On the Horsefly River the Horsefly Gold Mining Company (the old Harper leasehold) have their hydraulic elevator plant in place, and expect to commence operations early in the coming spring.

The Horsefly Hydraulic Mining Company, on the Horsefly River, owing to scarcity of water, have only had part of a season's work in this mine. The cement still bothers them for hydraulic working, and there is talk of turning it into a drift mine, with a plant for crushing the cement. The prospecting claims on the Horsefly have not yet succeeded in getting on to pay, still they are sanguine of making a strike some day in the near future.

On the South Fork of the Quesnelle River the Cariboo Hydraulic Mining Company have steadily pursued the even tenor of their way, the necessary force of men being employed in the mine, with another force employed in constructing several miles of new ditch, which was needed to bring the water in at a higher level to the mine, so as to obtain a greater pressure for their hydraulic pipes for next season's work. The results from the Company's work for the season are deemed quite satisfactory, over $127,000 being obtained for the season's work, and this with a very limited supply of water for the last two months of the working season; the last two wash-ups showing a great improvement over any ground worked during the first part of the season. Outside of this Company's work very little gold has been obtained from the South Fork of Quesnelle River during the season.

On the North Fork of Quesnelle River there has been a very considerable amount of work done during the season in the way of preliminary work and prospecting, also quite a number of new locations made.

The Victoria Consolidated Company commenced work early in the spring on Keithley Point with a good supply of water, and were progressing favourably until the freshet carried out the bridge which conveyed their pipes across the river; this put an end to their hydraulic work for the season. I have not learned what their intentions are for the prosecution of their work on Keithley Point.

On the other locations on the North Fork prospecting and preliminary work has been going on during the season, and there is little doubt but that some valuable mining properties will be developed on the North Fork during the coming season.

On the main Quesnelle River the companies owning mining leases have not carried on work for the season to the extent expected, some of them doing only enough work to hold their leases. It is to be hoped the coming season will see more active work carried on in this section.

On Keithley, Harvey, Snowshoe and other creeks in this vicinity work was carried on as usual while the water lasted, but as a whole this has not been a favourable season for miners on those creeks, the season being very backward in the spring, and following that a heavy freshet, after which the water failed altogether for the remainder of the season.

Re mineral claims in this division there is little to note, there being only four new locations made for the year, and on those previously located very little has been done in the way of development or prospecting.

CASSIAR.

BY JAMES PORTER, GOLD COMMISSIONER.

SIR,—I have the honour to inform you that owing to the scattered state of the mining population here and the great distance they are apart, etc., and the expense that would necessarily be incurred in visiting all points in order to gather anything like accurate information, I regret to say that I am not in a position this season to frame a mining report and to furnish you with mining statistics.

I think that the output of gold for the season might be computed as being a trifle less than that of last.

During the summer some prospecting was done in various directions, but so far I have not heard of anything of importance being discovered. Very little or no attention has been paid during the season towards quartz development here.

A few days ago a gentleman representing Mr. C. F. Law, of British Columbia mining renown, came here, and the object of his mission is to visit some sections of the district where quartz is known to exist. He at once started out intending to secure some samples of rock from these ledges.

I have received a letter from Mr. Law, saying that if he could get anything promising from here that it was his intention to come in here early next season.

There is plenty of quartz known to exist here, and I do not see why some of it should not be sufficiently rich to pay. So far but little attention has been paid to this place, and I honestly believe that if prospecting was turned in this direction that something of importance would be discovered. Some good openings are also here for hydraulic mining, and it is my honest opinion that if some attention was paid to this sort of mining that it would prove to be a good investment.

EAST KOOTENAY.

By W. A. Carlyle, Provincial Mineralogist

A short examination was made of those parts in East Kootenay where mining was being actively carried on, but with the exception of mines such as the North Star, Moyie Lake Mines, and the placer mines on Wild Horse Creek, little work other than assessment work was being done. However, in the southern part of Fort Steele District the prospectors were very busy during the past season, both in the Selkirks and Rocky Mountain Ranges, and a large number of claims were staked off in close vicinity to the North Star Mine and on the St. Mary's River, Bull River, Perry Creek, and their tributaries. The construction of the Crow's Nest Pass Railway, which now seems to be an assured fact, will certainly stimulate far greater activity, for there is no doubt whatever but that this part of the Province should be thoroughly explored as means of ingress and egress improve, as already some very valuable properties have been discovered and developed, and many locations have been made, which work will greatly enhance in value and importance.

Hitherto means of communication have been such that considerable time had to be consumed in reaching any part, and prospectors and mining men have been attracted to other parts more easy of access, but with a more extended steamboat service on the rivers, new roads and trails, and with keener interest aroused by the progress of mining in other parts of Kootenay, the Division of East Kootenay is on the eve of receiving much greater interest, with every probability that her latent resources will prove very valuable.

At Golden, in the office of the Gold Commissioner, is an excellent collection of samples of ore, mostly argentiferous galena and tetrahedrite ores, also copper ores, from the various lodes uncovered in the district.

Topography.

Running north and south for over two hundred miles, flanked on the east and west by the towering ranges of the Rockies and the Selkirks, is the wide and beautiful valley through which flows the Columbia River to the north, and the Kootenay River to the south, to join waters at Robson in West Kootenay. This valley is ten to thirty miles wide, and gently rises to the foot-hills along the main ranges, which are often bold and craggy and rise in lofty peaks.

Transportation.

Steamers.—From Golden, on the C. P. R. R., a very comfortable steamer of the Upper Columbia N. & T. Co., Capt. F. P. Armstrong, leaves for the Upper Columbia every Tuesday morning when navigation is open, and runs for most of the season as far as Mud Lake Landing, 113 miles, where passengers and freight are transferred by a horse tram, 4¾ miles, to the Upper Columbia Lake, where another steamer runs to Canal Flats, about 15 miles, and thence by the stage to Fort Steele, 46 miles, stopping over night at Hanson's, at Wasa Creek, 12 miles from Fort Steele, one of the best hostelries in Kootenay. When navigation ceases a weekly stage runs between Golden and Fort Steele, carrying the mails. To the south steamers of the same navigation company run down the Kootenay River from the North Star Landing, 6 miles above Fort Steele, to Jennings, and at high water these boats go as far north as Canal Flats, or about 4 miles from the steamer landing on the Columbia. Anticipating a large influx of men and supplies from the south during the present year, Capt. Armstrong intends establishing a daily steamer service, as long as the depth of water will permit, between Fort Steele and Jennings.

Roads.—A good waggon road extends from Golden to Fort Steele, whence roads radiate to Wild Horse Creek, Perry Creek and St. Mary's River, North Star Mine, Cranbrook, and to Tobacco Plains and across the border to the south.

Trails.—(*a.*) The Dewdney or Moyie Trail runs from Cranbrook south-west past the St. Eugene Mines, on Moyie Lake, to the landing on Kootenay River, where stop once or twice a week steamers on the Kootenay Lake service. This was the trail traversed by the placer miners in the early sixties.

(*b*.) The Toby Creek Trail, or Well's Trail, starts a few miles north of Windermere, and crossing the Columbia runs up Toby Creek to the Divide, thence down Hamill Creek to Argenta, at the north end of Kootenay Lake.

(*c*.) From Carbonate, south of Golden, a road for part way and trails lead up the different branches of the Spillimacheen River and into the McMurdo District. Of course there are many other trails, such as over the Crow's Nest Pass, etc., etc.

Ore.—Shipments are made by the steamers on the Kootenay Lake south to Jennings in the United States, and thence by G. N. R. R. to the smelters. The smelter at Golden has never yet been blown in, as no ore has so far been obtainable, but the development of the northern part of the Golden and other districts may yet supply these works, which were built rather prematurely.

FORT STEELE DISTRICT.

All the time available in this short visit of inspection was directed to the examination of those properties working in this district, and for notes regarding the discoveries on Perry Creek, Wasa and Bugaboo Creeks and the Dardanelles Mine, the writer is much indebted to Mr. Jno. E. Hardman, of Montreal, a mining engineer of wide experience and very high reputation, with whom the writer had the pleasure of travelling for three or four weeks.

NORTH STAR.

This valuable property comprises the *North Star*, *O. K.*, *Dreadnaught* and *Buckhorn*, Crown-granted; and the Rowan, Daffodil, Cromarty, Notre Dame, Dorval, Maverick, Good Luck, Canton, Full House, Brandon, Stemwinder and Ontario, mineral locations, owned by the North Star Mining Co., Ltd., Montreal. Pres., D. D. Mann; Sec., H. S. Holt, Montreal; Business Manager, N. W. Curran, Fort Steele.

These claims, 1,500 feet square, are located on a gently sloping mountain one mile south of Mark Creek, and 23 miles by waggon road west of the North Star landing on the Kootenay River six miles above Fort Steele, and 2,600 feet above the landing, or 16 miles directly west of the river. This lode was located in June, 1892, by Jos. Bourjouis, the locator of the War Eagle, Centre Star and Lily May, at Rossland, and since that time it has been so developed as to expose one of the largest bodies of silver-bearing galena ore yet uncovered in the Province; but it is to be hoped, and strongly recommended, that the company will follow the policy of extending the development work and keeping it well in advance of the mining of ore, and not rest content in simply working out the large body of ore now in sight, without the exploratory work so essential to the success and productiveness of any mine.

GEOLOGY AND ORE-DEPOSIT.

There was no time to study the geological conditions, but the rock inclosing the ore found in these and adjoining claims is dark grey with a fine-grained, hard and tough texture, apparently of igneous origin, except for slight evidences of bedding planes on the Sullivan Group, indicating the probability of its being very highly altered stratified rock. In the mine is rock looking much like the typical miner's "porphyry," running in places as tongues into the mass of solid ore, as if a dyke were there, but this might be simply the country rock altered near the ore-shute.

The Ore.—(*a*.) Is primarily a very clean, solid, argentiferous galena, rather fine-grained, with only a small amount of zinc blende, while underlying it along the foot-wall is the "iron-ore," or iron and maganese oxides, assaying about 20 ozs. in silver per ton. The assay value of the ore as per smelter returns is:—

Silver, 23.5 ozs. to 45.3 ozs. per ton; lead, 53 to 68%.

(*b*.) The upper part of the ore-shute has been decomposed to a mass of reddish-brown, black and yellow oxides and carbonites of iron and lead, with beautiful specimens of moss-like metallic silver and crystals of cerussite. There is a large amount of this ore, and unlike the "carbonate ore" in the Slocan it carries a higher silver value than the crude or solid galena ore, the values from smelter returns being:—

Silver, 52 to 60.8 ozs. per ton; lead, 49 to 57%.

In shipping ore a mixture is made of both kinds of ore and then sacked in jute sacks (made in Montreal) so that 16 sacks of the ore weigh one ton, and this is not low grade ore by any means, as is shown by the smelter returns on between two and three thousand tons sold during the past season, when the *net* or *yield* values averaged per ton:—

Silver, 30 ozs.; lead, 55 %.

Such ore was worth $52.40 per ton, and left a very good profit, after deducting costs of mining, transportation, smelting and duty.

Ore Body.—The existence of the ore-body was betrayed by the large amount of galena float on the surface, but it was not until much prospecting work (much of it very useless) had been done that the magnificent ore-body was found, the value and significance of the decomposed material first found apparently not having been appreciated until proven to be the richer carbonate ore overlying the unaltered galena.

The strike of the ore-body is nearly true north and south, and the dip to the east at an angle of 40° to 50°, the apparent greater flatness being due, it is believed by the writer, to a series of faults running north and south and dipping west that have faulted and lifted up the ore-shute in a series of short steps, a condition of affairs, if demonstrated to be such, that may be also found in other claims along this ore-bearing zone, but in nowise detrimental to their value, as dislocations or breaks are found, with few exceptions, in every mine.

The large size of the ore-body is shown in the mine workings. Shaft No. 1 was sunk 67 feet, and at 30 feet a short cross-cut to the west entered the ore, and along this level for a distance of 290 feet north and south a solid body continues, with fine ore in both breasts of the drift, with a thickness of 8 to 20 feet of ore, consisting of solid galena overlaid by decomposed or "carbonate" ore, which in one place was fully 15 feet thick. Along the dip this shute is known to be continuous for a width of 40 to 60 feet, and a large amount of ore now stands ready to be broken down. A cross-cut tunnel, 300 feet long, strikes this shaft at a depth of 60 feet, and continues west in barren ground 90 feet, the rock in the tunnel to the *east*, *i. e.*, in direction of the dip of the lode from a point 25 feet from the shaft changing from its very hard, solid character to a soft decomposed material with no ore, but at 105 feet east of the shaft the tunnel passed through a body 1½ to 3½ feet wide, strike north and south, dip east 60°, of soft yellow-coloured material, assaying 20 to 25 ounces of silver per ton, with no assay made for lead. Whether this is the continuation of the lode on the dip faulted up to its present position remains to be proven. Shaft No. 2, sixty-five feet north of No. 1, is sunk to the main work level, and then follows down the foot-wall for 22 feet, along which the ore-body is 6 to 8 feet wide.

During the coming season contracts are reported to have been made for the shipment of 5,000 tons of ore to the American smelters from the Landing, down to which the ore will be hauled on sleighs while winter lasts.

TIMBER AND TIMBERING.

The claims are covered by small, dead, black pine, and larger timber has to be hauled up to the mine in which the stopes are timbered up after the method of square setting, while the main tunnel, when necessary, is also well timbered.

WATER.

Not much water comes into the mine and can easily be handled by steam pumps when work is done below the tunnel level.

BUILDINGS.

In the shaft-house is a small steam hoist and a pump, and there were several large ore-houses filled up at the time of visit (October) with sacked ore. At shaft No. 2 is a horse whim, and a third shaft was being fitted up. There are good log buildings for the offices and assay laboratory, boarding and sleeping houses.

TRANSPORTATION.

(*a*.) A waggon road has been built from the Landing, 23 miles, to the mine, at a cost of $11,000, and in summer time a four-horse team will take down five to six tons of ore a day, and in winter six to eight tons, at a contract price of $5 per ton, horses being changed at the stables, half-way between the mine and the river.

(*b*.) The steamer during the season of 1896 ran from the 26th May to 22nd of August, and carried the ore to Jennings Landing at a contract price of $4 per ton.

(*c*.) The freight charges to the smelter at Great Falls, Montana, from Jennings was $4.50 per ton, while the smelter or treatment charge was $17 per ton for crude ore and $15.50 for "carbonate" ore.

The cost of labour was the same as in the Slocan District.

OTHER CLAIMS.

The company has done a little prospecting on some of its other claims, and to the west of the main ore shute, which is being worked on the North Star and Dreadnaught, it was claimed that more ore of the same character had been found in probably parallel leads.

THE SULLIVAN GROUP.

The *Shylock*, *Hamlet* and *Hope* mineral claims, owned by Jno. W. Cleaver, Pat. Sullivan, *et al.*, Fort Steele, and bonded to Col. Ridpath, Judge Turner, *et al.*, Spokane, are situated on Sullivan Hill, north of Mark Creek, and about 1½ miles north of the North Star, and two miles by trail from the road.

On this group there are large surface showings of mineral, not only of solid lead ore, but of concentrating galena ore, for which purposes the very ample supply of water and water-power of Mark Creek, 4,000 feet distant, will be easily available. Little prospecting had been done, but this work had been sufficient to indicate the relative importance of this property and the existence of an ore zone extending north and south, along which the ground has all been located between the claims of this group and the North Star. From the exposures of mineral there are evidently more than one lead in this belt, which further developing will prove up. The three claims of the property lie across this belt, and there are evidently two distinct ore-horizons, one on the Hope, the other on the Hamlet, or 12 to 1,500 feet apart.

The Hope.—On this claim for 7 to 800 feet there runs in a north and south direction a heavily mineralized belt, with a strong iron capping of typical gossan, and in shallow surface cuts are large exposures of mixed galena ore with considerable iron oxides resembling haematite, and a little iron pyrites, blende and mispickle. About 800 feet south of this showing of ore is a large exposure of light coloured, fine grained rock, more or less permeated with galena for a width of nearly 125 feet, in which a few pop-holes had been fired. The galena is generally arranged along the many small cracks in the rock mass, and if the amount of sulphides increase as depth is attained this may prove to be a large mass of concentrating material.

The Hamlet.—About 1,500 feet west of these croppings on the Hope, some excellent out-croppings of more or less solid galena ore had been stripped on the Hamlet Claim, and in stripping off the surface débris, large boulders of fine and coarse grained galena, exposing *in situ* at one place a body of solid galena ore eight feet wide. The dip and strike of this ore had not then been determined, but Col. Ridpath had just arrived with men and supplies sufficient for a short campaign of prospecting. West of this exposure of ore, other galena in place was uncovered, but beyond the many evidences of the presence of ore, probably in abundance, but little could be really learned from the little surface work done. Near by on these claims is highly altered rock with decided bedding planes, but also eruptive rock that in some places might be classed as a diorite, and this eruptive rock appears to be associated with the mineral.

OTHER CLAIMS.

As a result of the opening up of the fine ore-shute on the North Star, many locations were made in this locality along this belt during the past season, and on some of these properties, with only a little work done, this galena ore has again been found, while there are strong evidences of this belt along the strike, especially when crossed by the North Star road, where all the wash and the rock material is very heavily iron stained.

The *Quantrelle*, *Utopia* and *Stonewall Jackson*, lying south of the Sullivan Group, owned by F. P. Norbury, C. M. Edwards, *et al.*, had some ore reported exposed in the work done for assessment purposes, and these claims are said to have been sold to some gentlemen in Scotland. The vein has been traced by open cuts for nearly 300 feet, with, in one cut, 6 to 10 inches of solid galena, assays of which gave 18 to 23 ounces of silver per ton, and 55 to 57% lead. On the Stonewall Jackson there is said to be a quartz vein 12 feet wide, with some galena in the decomposed surface material, but, as on nearly all the other claims, little work has been done to show what the true conditions are.

The *Midnight*, lying immediately north of the North Star, has had considerable work done, with the disclosure of vein material.

The *Deane* and *All-Over* are owned by R. O. Jennings, C. D. Porter, and the Kansas City Smelting and Refining Co., and have been prospected to some extent, uncovering some mineral in place.

Work has been done on other locations, but during this year this locality will be developed to a much greater extent; claims of comparatively recent location will be properly prospected, and if more large ore-bodies are opened up, quicker transport facilities may be supplied, as a branch of the proposed new railroad can be built with very little trouble up along the foot hills to the proximity of these mines.

St. Eugene Group.

On the south side of Moyie Lake, 33 miles south-west of Fort Steele, reached by the Dewdney Trail, is an important group of claims extending south, up the mountain side from the lake, of which the *St Eugene*, *Peter*, *Loretta* and *Rose* (the last two fractional claims), Crown grants applied for, are owned by J. Cronin *et al.*, with a part interest bonded to Jno. A. Finch, who has been so successful in West Kootenay.

At an elevation of nearly 1,400 feet above the lake, in the flat-lying, highly-stratified shales, quartzites and silicious limestones, a vein of nearly solid galena is being developed, in a systematic manner, with a large amount of fine ore accumulating on the dump awaiting the advent of a railway for good transportation facilities, as it is believed that the Crow's Nest Pass R. R. must pass along this side of Moyie Lake, or within a very short distance of this mine, and then these large bodies of lead-silver ore will become very valuable. The strike of the vein is nearly east and west, with a dip of 65° to 80° south, and in the upper tunnel. No. 1, 170 feet long, for the first 40 feet there was found only mixed ore or galena, quartz, and country rock, then followed the more solid ore, in which at 65 feet an upraise to the surface for 40 feet passed through nearly solid ore, which from this point in the tunnel to breast continues as a solid glittering mass, 4 to 5 feet wide, of coarsely crystalline galena, while the face of the drift on the day of examination (Sept. 30th) was all ore, or solid clean galena. At the mouth of the tunnel a shaft was being sunk 6 by 10 feet, on a dip of 65° to 70°, and from top to bottom, or for nearly 35 feet, this working was all in solid galena ore, 5 to 6 feet thick, with the bottom all in ore. Tunnel No. 2, 100 feet below No. 1, was run as a cross-cut for 100 feet, and then for 300 feet along the supposed (but barren) course of the ledge, with but a short distance remaining to connect with the shaft above mentioned, which connection may serve to show whether this tunnel has been following the vein fissure, or simply parallelling it.

On the surface, this vein has been well traced for 800 feet, especially above the upper tunnel, where open cuts disclose mineral for nearly 600 feet, while to the west this vein passes through several claims to be described. For the most part the galena is very coarsely crystalline, with a very little zinc blende, and several stringers or veinlets run off from the main vein into the country rock, but the vein is pretty well hidden under the débris, on removing which the ore *en masse* has been found.

On the dump the ore taken out in development work, was being piled up, and it was claimed that in one large pile of clean galena ore the average values ran 45 to 50 ounces silver per ton, and 65 to 70% lead.

In another pile was collected a large amount of concentrating ore that would concentrate about 2½ tons to 1, but no ore was being extracted, except that mined in the exploration of this property, which will be able to ship a large amount of this silver-lead ore as soon as the means of easy shipment are supplied.

There is an abundant supply of good timber, good mine buildings had been erected, and should a concentrator be erected at the lake, then an aerial-rope tramway, dropping down 1,200 feet, can easily be constructed to bring ore down to the railroad or the mill; but in the meantime Mr. Cronin is contenting himself in developing these claims, and twelve men were employed.

Between the St. Eugene Group and Moyie Lake, ore has been found in three claims, and work was done during the past season, showing the continuation of the ore zone for nearly 4,000 feet.

Moyie and Queen of the Hills.

These two claims, owned by F. Houghton, C. E., Montreal, E. P. Davis, *et al.*, were located on the south-west of the St. Eugene Group, in June, 1893, and starting on the upper or eastern end of the "Moyie" claim, and extending into the "Queen of the Hills," or about 1,500 feet westerly of Mr. Cronin's workings, the upper tunnel runs in on the vein, with 25 feet of the ledge matter, carrying galena, carbonates and iron oxides, and then for 50 feet to the face exposes a vein of solid coarsely crystalline galena, with some blende, 2 to 4 feet wide, narrow ing at the face of the tunnel. On the dump were piled 2 to 300 tons of this ore, said to run 45 to 50 ounces silver per ton, and of course with a high percentage of lead.

On the surface there appears to be two leads, 4 to 500 feet apart, the southern one of which is thought to be the extension of the St. Eugene vein, and several small cuts were made in the iron-stained cap-rock, disclosing the galena more or less decomposed with quartz in the very silicious limestone country rock. On the lower or western end of the "Moyie," 600 feet lower down the mountain side, the lower tunnel was in 30 feet prospecting for ore that was showing immediately across the side-line in cuts on the Lake Shore claim.

Thr Lake Shore.

This claim and the *Legal Tender* a fractional claim, owned by Chas C. Farrel *et al.*, lie between the Moyie claim and the lake, and are crossed by the Dewdney trail. In several cuts and strippings galena ore, more or less mixed or scattered, has been exposed, ore that has assayed from 40 to 60 ounces silver per ton, besides the lead value. A working tunnel had been started and was in 40 feet, with only a few inches of galena showing, but more work will be done in the search for more continuous ore bodies, which may be found below in a less scattered form. There is a good supply of mine timber, and a new cabin was being constructed below the workings near the trail.

Tracy Creek.

On Tracy or Wasa Creeks several veins have been located in the mountains of the Rockies, and also nearly as far south as the Boundary Line, on which work is now progressing. The Tracy Creek mines are a few miles east of Wasa (or Hanson's), and about 5,000 feet above Kootenay River, and at present comprise two groups.

The *Stella* and *Cashier*, owned by G. Scott, A. Murtz *et al.*, Fort Steele, were located in October, 1895, on the north side of Tracy Creek basin. The rocks are stratified, mostly slates, with bands or dykes of eruptive rocks, and the quartz vein running N. E. by S. W. and dipping at a flat angle or 28°, contains iron pyrites, galena and tetrahedrite, assays of which have given from picked samples 130 ounces silver and $13 in gold per ton; also 14 % copper and 5 % lead. A little work had been done, but supplies were being sent up to keep two men employed all winter sinking an incline on the lead.

On the *Skylark* and *Rover*, south of the Stella Group, Capt. F. P. Armstrong is running in a 200-foot tunnel on a galena vein of about 8 feet of mineralized calcareous quartzite, in which much solid galena ore is seen, both coarsely crystalline and of the steel galena variety. This vein can be traced throughout one claim with a strike S.E. and N.W. (mag.), and a dip of 50° south, and shows very plainly in the face of the cliff, with bunches of the solid galena 8 to 12 inches wide. Assays yield 30 to 35 ounces of silver per ton, and 65 to 75 % lead, and should mining operations be undertaken a good waggon road can easily be built right to these properties.

GOLD PROPERTIES.

Perry Creek.

Considerable excitement has been aroused by the discovery and location of several very large quartz ledges on the north side of Perry Creek and west of Saw-Mill Creek, which flows into Perry Creek, a tributary of the St. Mary's River and a stream much washed in the seventies for placer gold, two or three miles above which placer ground, or by roads and trails 25 to 30 miles westerly from Cranbrook, these quartz leads are now located. For 5 miles west and 2 miles east of Ellwood Creek, a small branch of Perry, the country has been all located along the course of three, if not more, quartz ledges which have proved to be auriferous, but to what value had not then been determined.

The three ledges seen by Mr. Hardman were running N. 10° W. and S. 10° E., or parallel with the stratification of the country rock or slates, and standing nearly vertical about 1,200 feet apart.

Vein No. 1, the first met with on going up from the Creek, running about north and south with a dip from 50° to vertical, is 1½ to 2 feet wide, and can be traced through 7 claims. Although 13 claims (or over 3 miles) had been staked off along this lead, on which claims owned by John Sherwood some surface work had been done, showing up the vein of whitish granular quartz containing some iron pyrites and magnetite, from which free gold can be got by crushing and panning samples.

Vein No. 2 is 1,200 feet west and 9 to 11 feet wide, on which are claims pegged off by Jno. Sherwood, Chas. Ellwood (in August, 1896) and others, but little work had been done except on the "Snow-Shoe" and "Sour Dough" in a 9 foot vein of solid quartz, with a little iron pyrites, which had been clearly traced through 7 claims, or for nearly 10,000 feet, while 2 miles south of these claims the vein is said to be again shown in some shallow cuts. Assays of $6 in gold per ton had been got from this vein, and also fair prospects by panning.

Vein No. 3, or the "big vein," still further west about 1,200 feet from No. 2, is a quartzose band in the slates over 40 feet wide, from which the locators claim to have got assays of $4 to $15 in gold. Over four miles of locations have been made along this ledge in October, but very little work had been done, although much will be done, as many claims have at the present time been bonded or sold, and during the coming season much attention will be directed to this creek, and also to the ground along the tributaries of the St. Mary's and Moyie Rivers.

The timber on the Perry Creek locations is small and scanty, and if mills are erected they will have to be down on Perry Creek, where is abundant water for milling purposes, about 500 feet below the small vein or No. 1, and 900 feet below the 40-foot vein. The mountains are all much rounded and not cliffy, and should these veins prove to be rich enough in gold to pay, there will not be much difficulty in getting in the necessary stamp mill machinery, etc.

THE DARDANELLES.

On the tributaries of the Wild Horse Creek, famous for the production in the past of its placers, many mineral locations have been made, on one of which, the *Dardanelles*, mining was being done. This claim and the "Mother Lode" and "Ethel," owned by Banks Bros. and O. S. Frigeele, Fort Steele, lie on the mountain side 2,000 feet above Wild Horse Creek, and 1½ miles by a steep trail from the arrastra on that creek (10 miles east of Fort Steele). The quartz vein, 2 to 3 feet wide, striking N. W. by S. E., and dipping S. W. at an angle of 23° to 33°, contains a small amount of iron-pyrites and galena besides the gold values (not ascertained), and can be traced for 4,000 feet in the country rock of slate. It is being developed by an incline, in which the maximum width of ore is 4 feet, but at 130 feet the vein has split in two or bifurcated, the upper part being about 10 inches wide, while the lower, dipping at an angle of 45°, is only 3 inches wide. The ore is roasted in heaps at the mine, then rawhided down to a new arrastra near by an overshot wheel, the arrastra being 9 feet in diameter, 2 feet 4 inches deep, with 5 to 800 pound drags, and equipped with 3 copper plates and blanket sluices. As no clean-up had been made no details as to amount of gold being saved could be secured.

THE INVICTA GOLD MINING (PLACER) CO., LTD., ENGLAND

This English Company having secured about one mile along Wild Horse Creek, from which much gravel had been washed during the last thirty years, during the past season began the installation, under the superintendence of Mr. J. W. R. Young, M. E., of a requisite plant, sluices, etc., for the hydraulicing of the large bank of gravel shown in the engraving, but as there had been a long delay in the transportation of piping, monitors, etc., but little washing could be attempted during the season, although about 70,000 cubic yards were moved, that yielded, according to the annual report of this company, 7 cents per yard.

The bank is now about 5,000 feet long, and washed back 6 to 800 feet from the creek by former holders of small claims, and now stands nearly vertical, showing several more or less uniform strata dipping easily towards the creek, of which the (*a*.) upper stratum of 50 feet to 60 of top dirt carries no value; (*b*.) the next stratum or "red-dirt" is about 20 to 25 feet thick, and so far has proved to be most profitable; (*c*.) the blue-dirt stratum, 35 feet thick in places, is so solid that it has to be broken up by dynamite before hydraulicing; (*d*.) the alternate layers of clay and conglomerate of considerable depth, are to be tested for their values, and these lie on the bedrock of highly tilted chloritic slates. A large amount of dirt on the bedrock has not been tested, but two shafts are being sunk this winter for this purpose, which, if profitable, may have to be washed out by driving in a tunnel from an advantageous point down the creek, and then washing the dirt into sluices laid along this working.

There is a considerable number of rounded boulders too large for the sluices, that accumulate, and as yet no derricks have been supplied for their removal, in case the ground now underlying is washed out down to the gutter.

Dump.—A large amount of boulders collect at the outlet of the sluices, which are then extended out towards the stream as these pile up; the finer dirt collects more or less in the stream, but is all sluiced out by the yearly freshets.

Water—Is supplied by two ditches on the north side of the creek, of which the "China" ditch, 3¾ miles long, supplies, when running full, 1,000 miners inches of water, and the "Victoria" ditch, 4½ miles long, 1,500 inches, the former supplying the water to the monitors in the pit, under a head of 250 feet, the latter of 350 feet. The water usually begins to rise about the middle of May, with a good head about June 1st, which lasts from 3 to 4 months and then begins to decrease rapidly, so that effective hydraulicing can only be done for about five months in favourable seasons.

Plant.—From the pressure boxes at the ditches, two pipe lines, 1,300 feet apart, consisting of steel pipe of 16 to 10 gauge and 22 to 12 inches in diameter, lead down into the pit where, when the water supply is full, one No. 4, one No. 3, and two No. 2 monitors are used. Water is also used by letting it cut down the bank by running over the edge as shown in the engraving.

Sluices.—There are two about 650 feet long each, 3 by 3 feet, with a grade of 8 inches to 16 feet. No mercury is used or under-currents, as there is claimed to be no fine gold, 95% of the yield being saved in the upper 100 feet of boxes.

An electric light plant of 12,000 candle power is driven by a Pelton wheel, and serves to light all the workings and permit night working.

Cost of Labour.—Pipemen receive $3.50 per 12 hours, and whitemen for other labour $3, and Chinamen $2.50 per 10 hours. During the coming season the company will be so equipped for work that they may avail themselves of the full water supply, and thus handle a much larger amount of dirt, and plans for future working of the property will be perfected.

NIP-AND-TUCK GOLD MINING CO.

This placer mining company of Vancouver, has rights over the placer ground below the Invicta ground, but on the south side of Wild Horse. There is a ditch about 5 miles long for the water supply, and as Mr. J. H. Cunard, Superintendent, was engaged near the head of the water-way on the day of visit, he could not be seen for further particulars, but a very good clean-up is said to have been the result of the season's washings.

Quite a number of Chinamen are washing on small leases, and down in the canyon they were building a large flume, so as to be able to work out the creek bottom in low water.

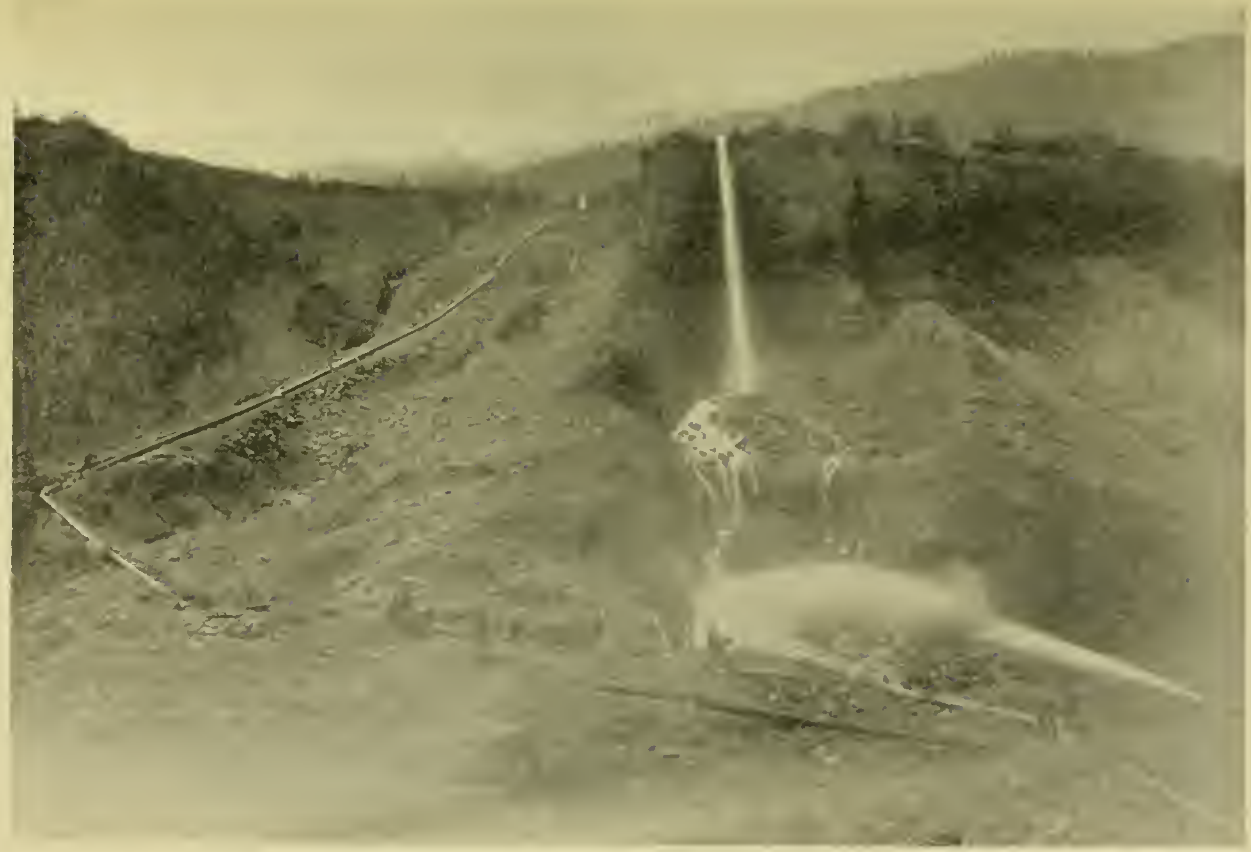
COAL AND COKE AND OIL.

The building of the Crow's Nest Pass R. R., and the demand for coal, and more especially coke, are attracting much attention now to the large deposits of coal that will be made available by this railway, and by the splendid coking qualities of this coal, or of a large part of it, and the subjoined report by Dr. Selwyn, late Director of the Geological Survey of Canada, will be of great interest at this present juncture. From the analysis given it will be seen that an excellent coke, very low in ash, can be produced; a coke not excelled by any other made in the west; and as large smelting works are now being constructed, this fuel supply will be a valuable factor in the smelting of the ores of this Province within her own borders. With the advent of the railway, the oil fields described will also receive that exploration their surface indications warrant.

REPORT ON THE COAL FIELDS.

In connection with this may be quoted the following extracts from the Summary Report on the operations of the Geological Survey of Canada, for 1891, giving an account of a visit of Dr. Selwyn, C. M. G., into these coal fields and oil fields, in the summer of 1891:—

"On the 31st of July, Colonel Baker joined me here, and on the following day we camped at the east end of Crow's Nest Lake, and on the next day, 2nd of August, we reached the coal prospecting camp, situated about 1,200 feet above the trail, on the ridge which runs in a



GOLD PLACER MINING, WILD HORSE CREEK, EAST KOOTENAY.

THE INVICTA GOLD MINING CO. LTD. (ENG.)

north-easterly direction between Marten Creek and Michel Creek, and form the west side of the valley of the west branch of Michel Creek. From this ridge a number of spurs, with steep intervening gullies, descend abruptly to the trail; in these, and on the intervening ridges, a wonderful series of coal seams is disclosed, one above the other from near the level of the trail to the summit of the ridge. No exact measurements were taken, and it may be that some of the lower cannel seams are the upper ones repeated by faulting. The out-crops which can be seen on the ground are as follows, twenty seams in all, showing a total thickness of 132 feet of coal:—

No. 1	5 feet.	No. 1 to 10, inclusive, are cannel coals.	No. 12 (Peter seam)	15 feet.	
„ 2	3 „		„ 13	7 „	
„ 3	4 „		„ 14 (Selwyn seam)	6 „	
„ 4	2 „		„ 15 (Jubilee „)	30 „	
„ 5	4 „		„ 16 (Williams „)	20 „	
„ 6	3 „		„ 17	5 „	These 4 are cannel coals.
„ 7	2 „		„ 18	3 „	
„ 8	4 „		„ 19	2 „	
„ 9	5 „		„ 20	2 „	
„ 10	5 „			132	
„ 11	4 „				

"The number and thickness of these seams in the above table are as supplied by Mr. Fernie, who has superintended all the exploratory work that has been done on the seams. Between the eastern out-crops I examined, and the western ones close to the junction of Marten Creek and the west branch of Michel Creek, is a distance of about two miles along the steep mountain side, to the north of the trail. Within this distance the out-crops were seen of nearly all these seams, either on the ridges or in the sides of the ravines which score the face of the mountain. The few hours I was able to spend on the ground, while not sufficient to enable me to affirm the absolute correctness of the details of the table, were, however, ample to enable me to see that there is in the Crow's Nest Pass, between the eastern summit, 4,330 feet above tide, and the valley of Elk River, in British Columbia, an area of not less than 144 square miles, that is destined to be one of the most valuable and most productive coal fields in Canada. A rough calculation would give about 49,952,000 tons per square mile. If one-half of this is available, there are in each square mile 24,976,000 tons. The average elevation of the field is about the same as that of Canmore and Banff, or between 4,000 and 5,000 feet. From Pincher Creek westward to Elk River the Pass presents no difficulties for railway construction. The eastern entrance to the Pass in Alberta is 3,800 feet, and where it comes out on Elk River is 3,300 feet, the highest intervening summit being 5,500 feet. A better route to the Elk River, however, than that of the present trail, would be to follow down Michel Creek, from near the eastern summit, and thus avoid the western and higher summit, and reach Elk River about ten miles above the mouth of Coal Creek. The distance through the Pass from Lee's Lake, Alberta, to the Elk River, is about thirty-seven miles.

"On the 4th August, after devoting the forenoon to a further examination of the Marten Creek seams, we proceeded through the Pass and reached Elk River at 6 p.m. No coal seams were seen until about four miles above the mouth of Coal Creek; here, at the mouth of a steep rock gulley, about 200 yards to the right of the trail, a fine seam of coal, 7 feet thick, had been cut into. The section exposed showed, in descending order:—

Shale	10 feet.
Hard ferruginous band	1 „
Coal	1.6 „
Shale	7.6 „
Coal	7.6 „

"Cherty conglomerate and massive gritty sandstones are seen both above and below; the dip is about E. 10 degrees, N. 15 degrees—20 degrees. A close search along the mountain side, between here and the water-shed at the head of Coal Creek, would almost certainly disclose the out-crops of many more of the Marten Creek seams.

"On the 5th August we descended the Elk River Valley about seven miles, then turning to the left ascended the mountain, a steep climb of 1,500 feet. Here on top of a broken-down cliff of massive sandstone, about 50 feet thick, we came to the first of a series of coal seams, the dip being E. 20, N. 35, and the seam 25 to 30 feet thick, with a shale parting about 2 feet, barometer 24.93. Ascending 130 feet, over shales and brown thick bedded sandstone, forming a similar broken-down cliff of about 50 feet, a second seam of coal was reached, also 30 feet thick, bar. 24.80. Above this four more seams were examined:—

No. 3	15 feet,	bar. 24.57
" 4	4 "	" 24.50
" 5	7 "	" 24.42
" 6	30 "	" 24.35

"Above No. 6 there are six more seams which were not visited, but the particulars of which, given to me by Mr. Fernie, are as follows:—

No. 7	10 feet,	100 feet from	No. 6
" 8	4 "	100 "	" 7
" 9	7 "	100 "	" 8
" 10	2 "	100 "	" 9
" 11	7 "	100 "	" 10
" 12	4 "	200 "	" 11

"The distances are approximate only; they have not been measured.

"The above gives a total thickness of 148 feet of coal against 132 feet in Marten Creek area on the eastern side of the basin, while in other respects the seams correspond so closely as to make it almost certain that, except where cut out in the valleys, they are continuous beneath the whole intervening area. For much detailed information respecting the Crow's Nest Pass, the annual report of the Geological Survey, Volume I., Part B, 1885, already cited, and the accompanying map can be referred to.

"Many of the seams are first-class coking coals and other are good gas coals, but none of them are anthracites. For analyses of those of the Jubilee and Peter seams, Marten Creek, *see* Annual Report of the Geological Survey, Volume III., Part II., pp. 12s to 15s, and for those of the "cannel" seams, Volume IV., pp. 7r and 8r."

REPORT AND ANALYSES OF SAMPLES OF COAL

The following is the report and analyses of the various samples of coal made by G. C. Hoffman, Esq., F. Inst. C., Chemist and Mineralogist of the Geological Survey of Canada:—

Coal.—From the Peters seam, second crossing Marten Creek, Crow's Nest Pass, Rocky Mountains, British Columbia. Seam said to be 14 feet thick. Geological position, cretaceous Kootanie series. Taken thirty feet in from outcrop. Locality referred to by Dr. Geo. M. Dawson in Annual Report for 1895, p. 75b.

"This coal has crumpled, foliated structure; shows slicken-sides; colour, greyish black to black; lustre, resinous; that of the slicken-sided surfaces occasionally inclining to vitreous; firm, fracture, irregular; slightly soils the fingers; does not contain any interlaminated calcite, but occasionally here and there a delicate film of iron pyrites; powder brownish-black; it communicates a faint brownish-yellow tinge to a boiling solution of caustic potash; resists exposure to the air.

"Specific gravity, 1.3052 (temp., 15.5 degress C.). Weight of one solid cubic foot, calculated from the specific gravity, 81.57 pounds.

"Analyses by slow and fast coking gave:—

	Slow Coking.	Fast Coking.
Hygroscopic water	1.79	1.79
Volatile combustible matter	25.45	33.04
Fixed carbon	69.14	61.55
Ash	3.62	3.62
	100.00	100.00
Coke per cent	72.76	65.17
Ratio of volatile combustible matter to fixed carbon	1 to 2.72	1 to 1.86

An ultimate analysis gave (exclusive of sulphur, ash and hygroscopic water):

	Slow Coking.	Fast Coking.
Carbon	80.51	85.57
Hydrogen	5.20	5.53
Oxygen and nitrogen	8.37	8.90
Sulphur	.51	.... ..
Ash	3.62	......
Hygroscopic water	1.79	.....
	100.00	100.00

"Calorific power, experimental, determined by Thomson's Calorimeter:—

Indicated power of fuel in calories 8,050

Indicated evaporated power, 14.99 pounds of water (at 100 deg. C.) per pound fuel, deducting the units of heat necessary to vaporize the hydroscopic and combined water of combustion of the fuel, we have an indicated power of fuel in calories. . . . 7,790

Indicative evaporative power, 14.1 pounds of water (at 100 deg. C.) per pound fuel, and these latter figures will express the greatest effect obtainable from this fuel in generating steam. Calorific power, theoretical, calculated from its chemical composition:—

Expressed in calories 7,990

Pounds of water (at 100 deg. C.) evaporated by 1 lb. fuel 14.39

Deducting from these figures the heat units required to vaporize the hygroscopic and combined water, and water of combustion of the fuel, we obtained the following values:—

Expressed in calories 7,730

Pounds of water (at 100 deg. C.) evaporated by 1 lb. fuel 14.39

Which gave the closest approximation to the available heat. It yielded by slow coking a non-coherent coke; by fast coking a compact, firm, coherent coke in concentratic layers, in which the form of the particles of coal from which it has been derived is entirely obliterated; gases evolved during the coking burnt with a yellow, luminous, smoky flame. Colour of the ash, white, with a faint, reddish tinge; exposed to a bright red heat it does not become agglutinated; at a most intense red heat it becomes slightly fritted."

Coal.—From the Jubilee seam, second crossing Marten Creek, Crow's Nest Pass, Rocky Mountains, British Columbia. Seam said to be 30 feet thick. Geological position, cretaceous Kootanie series. Taken fifty feet in from outcrop. Locality referred to by Dr. Geo. M. Dawson in Annual Report for 1885, p. 75b.

The description given of the immediately preceding coal, viz., that from the Peter seam, applies also to this one, the only difference being that this coal did not contain any visible iron pyrites, and communicated a very pale, brownish yellow, and hence a somewhat more decided colour to a boiling solution of caustic potash.

"Specific gravity, 1.3088 (temp. 15.5 deg. C.). Weight of one solid cubic foot, calculated from the specific gravity, 81.80.

"Analyses by slow and fast coking gave:—

	Slow Coking.	Fast Coking.
Hygroscopic water	1.89	1.89
Volatile combustible matter	24.88	30.41
Fixed carbon	68.86	63.38
Ash	4.37	4.37
	100.00	100.00
Coke, per cent	73.23	67.70
Ratio of volatile combustible matter to fixed carbon	1 to 2.77	1 to 2.08

"An ultimate analyses gave (exclusive of sulphur, ash and hygroscopic water):—

	Slow Coking.	Fast Coking.
Carbon	80.04	85.82
Hydrogen	4.94	5.30
Oxygen and nitrogen	8.28	8.88
Sulphur	.48	......
Ash	4.37	......
Hygroscopic water	1.89	......
	100.00	100.00

"Calorific power, experimental, determined by Thompson's Calorimeter:—

Indicated power of fuel in calories..................... 8050
Indicated evaporative power, 14.99 pounds of water (at 100 C.) per pound of fuel.

Deducting the units of heat required to vaporize the hygroscopic and combined water, and water of combustion of the fuel we have an—

Indicated power of fuel in calories..........................7990
Indicated evaporative power, 14.51 pounds of water (at 100 deg. C.) per pound of fuel.

And these latter figures will express the greatest effect obtainable from this fuel, when used in generating steam.

"Calorific power, theoretical, calculated from its chemical composition:—

Expressed in calaries 7990
Pounds of water (at 100 deg. C.) evaporated by 1 lb. of fuel....14.88

Deducting from these figures the heat units required to vaporize the hygroscopic and combined water, and water of combustion of the fuel, we obtain the following:—

Expressed in calories...... 7618
Pounds of water (at 100 deg. C.) evaporated by 1 lb. of fuel....14.18

Which latter gives the closest approximation to the available heat. It yields, by slow coking a non-coherent coke; by fast coking, a compact, firm, coherent coke, in concentric layers, in which the form of the particles of coal from which it has been derived, is entirely obliterated; gases evolved during coking, burnt with a yellow, luminous, smoky flame. Colour of ash, white; exposed to a bright red heat, it remains unaffected, at a most intense red heat it becomes fritted."

Coal.—From second crossing, Marten Creek, Crow's Nest Pass, Rocky Mountains, British Columbia. There are said to be four seams of this particular material at this locality, having a thickness of respectively, 3, 4, 5 and 6 feet Geological position, Cretaceous, Kootanie series.

"Structure compact, made up of more or less spherical or lenticular shaped nodular grains of pitch-black colour and brilliant lustre, thickly disseminated through a matrix of dull grayish-black coaly matter. Does not soil the fingers; tough; sonorous; fracture somewhat irregular, with a tendency to large conchoidal; powder, brownish-black; it communicates a reddish-brown colour to a boiling solution of caustic potash. Takes fire in a lamp-flame, burning with a yellow, luminous flame which, however, dies out almost immediately after withdrawal from the source of heat. Resist exposure to the air. From a microscopic examination of thin slices of this coal, it is inferred that the aforementioned nodular grains consist of an altered resinous matter.

"Analyses by slow coking and fast coking gave:—

	Slow Coking.	Fast Coking.
Hygroscopic water	2.10	2.10
Volatile combustible matter	44.41	57.71
Fixed carbon	43.63	30.33
Ash	9.86	9.86
	100.00	100.00
Coke, per cent	53.49	40.19
Ratio of volatile combustible matter to fixed carbon	1 to .98	1 to .52

"It yields by slow coking, a bulky, coherent, highly vesicular coke; by fast coking, a firm and lustrous coke in concentric layers, in which the form of the particles of coal from which it has been derived is entirely obliterated, and of about the same, or if anything, less bulk than the original coal. When heated in a covered crucible, it produces a very large amount of gases which burn with a yellow, luminous, very smoky flame. Colour of the ash, pale reddish-white, when exposed to a bright red heat it remains unaffected, at a most intense red heat it becomes slightly sintered.

"This material constitutes an excellent gas coal, not only by reason of the large amount of volatile combustibe matter it is capable of affording, in which respect it is superior to a very large number of cannel coals, which are employed for gas-making, but also from the fact that this would appear to be of superior quality for illuminating purposes."

Report on Oil Fields.

The following are extracts from Dr. Selwyn's report of his visit in 1891, to the oil fields, situated in the south of East Kootenay (see Summary Report, Geological Survey of Canada, 1891, pp. 9, 10):—

"Cameron Falls Brook is a rapid mountain stream eight or ten yards wide. After following it up about a mile and a half on the left bank, Mr. Fernie, my guide, remarked that we must be close to where the oil had been seen. He had scarcely spoken when, while still in the saddle and on the trail eight or nine feet above the brook, I noticed a powerful odour of petroleum. Descending to the edge of the water and stirring the stones and gravel in the bed of the stream, considerable quantity of oil at once rose to the surface and floated away. Crossing to the right bank, some inches above the then level of the stream, here, skimming off the surface of a shallow pool, a wine bottle full was soon collected. This can now be seen in the Geological Survey Museum. Sixty or seventy yards below where the oil was seen, a rocky reef of gray silicious dolomite crosses the creek and rises into a steep bluff on the left bank; on the right bank, seven or eight feet above the creek, a broad, thickly timbered flat extends for 150 yards to the base of the bordering mountains, which culminate six miles to the south-west at the boundary monument, 6,000 feet above sea level. No work whatever has been done to test the nature of the oil sources. A comparatively small outlay for some shallow sinking or boring on the flat above described would do this.

"On the 24th, we proceeded down the valley, and about four miles north of the 49th parallel the trail came down to the level of the brook, and here, on the edge of a beaver dam pool, there were ledges of dark blue shale dipping E. 30°, N. 12°. Lifting layers of this at and below the water, a quantity of dark green circular parches of oil rose to the surface, and a precisely similar result followed by stirring up the mud in the bottom of the pool. This place is about 15 miles in a direct line west, 10 degrees south, from the occurrance on Cameron Falls Creek, the main watershed of the Rocky Mountains and Mounts Kirby, Spence and Yarrell intervening, oil is said, by the Indians (the Stoneys) who frequent this region, to occur at other points, in the Akamina Brook Valley, both above and below that recorded. The Akamina joins the Flathead River in Montana, about four miles south of the International Boundary. The Beaver dam oil is of a dark greenish-black, and does not apparently differ much from that of Cameron Falls Creek. Preliminary tests might be made here by sinking a shallow shaft in the shales at the Beaver dam pool, and by boring on the sandy and gravelly flat country about two miles and a half north of the boundary line.

At about a mile and a half higher up, the creek leaves the high mountains, which border its upper course in a north-easterly direction up to the main watershed some twelve miles distant, and here, at the edge of the water, on the left bank, I found hard, dark flinty shales like those at the Beaver dam pool on the Akamina, dipping S. 25 degrees, 30 degrees, W. 25 degrees. Directly the layers of this rock are raised, the oil rises and spreads over the surface of the water in such abundance that a short time suffices, with the aid of a tin cup, to collect a bottle full. Here, also a considerable quantity of gas escapes from the cracks and joints in the rock, and ignites freely on the application of a match.

"Less than half a mile higher up, on the right bank and on the opposite or west side of the valley, oil was again found issuing from the base of the bank or drift, which has here filled the valley and causes the stream to make a sharp bend eastward to the base of the opposite mountain. No rock was exposed here, but every stone in the bed of the creek, especially on being broken or rubbed, gave out a strong odor of petroleum. The oil collected here, a sample of which can be seen in the Museum, differs entirely in appearance from those of the Cameron Falls Creek and Akamina or Kish-e-ne-nah Creek. Some of it was of a light lemon-yellow, but most of it nearly the colour of pale brandy and with a very powerful petroleum odor."

WINDERMERE—GOLDEN—DONALD DISTRICTS.

Some prospecting work was done during the past season, most of it in the Selkirks, but also some in the Rockies, and from the very fine samples of ore seen, and the reports of the characteristics of the ledges, a large and rich section of the country is awaiting easier means of access, and the transport of ore to smelting centres.

The *Thunder Hill* property, 1½ miles west of Upper Columbia Lake, was standing idle, the ore having proved unsuitable for concentrating, for which purpose a mill was erected on the lake, but recently this property has been tested for its gold values, but with what result is not known. The ledge is reported to be very large, and if it contains gold in paying quantity, it should be thoroughly exploited.

Bugaboo Creek.—Six miles west of the Spillimacheen Landing or Galena, Mr. F. W. Aylmer of Golden, was working the "Balrath" group of two claims, on which crossing the slates and quartzites, was a wide vein strike, N. W. and S. E., dip 70°, about 16 feet wide, of which 11 feet were solid fine-grained opaque quartz, and 5 feet broken slate and quartz stringers. A cross-cut tunnel, 150 feet long, cuts the vein, where is 9 feet of quartz carrying about 20% iron pyrites. Mr. Aylmer has got assays of $2.50 to $36 in gold per ton, and if it proves to be profitable enough for milling, there is abundant and excellent water power right at the mine.

Toby Creek.—Prospecting was in progress in this country, now opened up by a trail, and veins 10 to 22 inches wide of silver-bearing galena were being located.

Vermont Creek.—From Well's Landing, 30 miles north of Golden, a sleigh road leads back 22 miles up the south fork of the Spillimacheen to Vermont Creek, where on the "*Minnie*," "*Ruth*" and "*Charlotte*," located in 1893, Capt. Armstrong had mined over 150 tons of galena ore, carrying zinc blende.

McMurdo District.—Some prospecting was being done, and assessment work, but nothing was doing on the "*Bobbie Burns*" and "*International*," gold quartz veins situated along branches of the Spillimacheen.

Some have waited long and patiently for the wave of mining interest to flow through this large territory, and it will not be long now before the hidden resources here will receive that careful examination they merit.

BY J. F. ARMSTRONG, GOLD COMMISSIONER.

The chief statistics are—

	1895.	1896.	Increase.
Free Miner's Certificates	404	537	33 per cent.
Other Mining Receipts	$ 2,203 10......	$ 2,873 26.....	76 〃
Value of Mineral Output	17,575 00.....	154,427 00......	779 〃

The value of the output from placer mines has decreased in consequence of several properties formerly worked by hand passing into the hands of hydraulic companies, who did not get their plant into operation until the best part of the season was over. The wash-up for the balance of the season was satisfactory to the proprietors, and both companies on Wild Horse Creek are now well prepared for next year's work. A little desultory placer mining was done on other creeks, but the proceeds were small.

The output from lode mines is practically confined to shipments from the North Star Mine. This would have been larger but for accidents to two of the largest steamers transporting the ore, one being laid up for a month, and another being sunk at the beginning of the best stage of water. The shipments from this mine consisted of 2,544 tons of ore, yielding 83,220 ounces of silver and 3,179,807 lbs. lead.

Development work has been done on the Sullivan group, on Mark Creek, on the Cronin group, on Moyie Lakes, on the Dibble group, on Lost Creek, and on a few others, while the work on the bulk of the claims has been confined to the necessary representation. The Cronin group has much ore on the dump, but will not make shipments until the construction of the Crow's Nest Railway, which is expected to pass close to the mine.

During the past season some capital has been secured, and the spring of 1897 will see more men at work on development than any previous season.

Fine prospects, on which little work has been done, are numerous, and capitalists who are willing to assist in development work, can find profitable investments.

The number of prospectors in the district has increased, but the majority of them have only enough capital to locate and represent their claims, and without more financial strength the progress of mining will be slow.

If the Provincial Mineralogist could visit and make a report on the district at an early date next summer, it would be of great advantage to the mining interests, for a thorough examination by a thoroughly competent person, will be of more value than the information which I could give as to the mineral character of the different localities.

As a great influx of prospectors and investors is expected next season, I add to my report a list of the localities in which lode mines have been located or worked during the season, together with a description of the means of access to the office of each division mentioned. I consider that the district has a good number of useful trails; they have not always been located to the best advantage, but they are being gradually and systematically improved, and in laying out new trails, the question of gradual gradients is kept in view, and where advisable the trails are built on a location fit for a waggon road.

Means of Communication, Etc.

In this district, the Mining Recorder for each division, has his office in the town from which the division is named.

Fort Steele is centrally located for its division, and is a good point for the purchase of supplies. It can be reached from Golden, B. C., on the C. P. R., and from Jennings, Montana, on the Great Northern Railroad, by steamer during the season of navigation, and by stage during the rest of the year, and by the Moyie trail from West Kootenay *via* Goat River, and by the St. Mary's trail from Kootenay Lake *via* Pilot Bay. The trunk road from Golden to Fort Steele is in good order, and fit for the transportation of heavy loads; waggon roads radiate from Fort Steele to Cranbrooke, to a point on the St. Mary's River near Mark Creek, to the placer mines on Wild Horse Creek, and to the International Boundary Line at Tobacco Plains. With the exception of the last, these roads are in good order.

Windermere is situated on the trunk road on the line of navigation from Golden. It is in a good farming country where produce can be purchased at reasonable prices. The northern part of the division situate at the head of the Kootenay is, from want of trails, difficult of access, though not distant from stations on the C. P. R. in Alberta.

Golden is on line of the C. P. R., and is well supplied with stores. All supplies for points south are sent from this place by boat or waggon, to the different landings from which the trails diverge.

In the Donald division, the trails are built from the different railway stations. The northern part of the division is almost unexplored.

How access can be obtained to the different localities mentioned in the above list:—

Fort Steele Mining Division.

Mark Creek is reached by a waggon road, from the North Star steamer Landing, on the Kootenay. This road will serve as the outlet for many claims with which it can be connected at a small expense. The mouth of Perry Creek is not far from the end of the St. Mary's waggon road, and it is intended to continue this road some distance up the creek in 1897. The other tributaries of the St. Mary's, can be reached by a good trail, completed in 1896, from the end of St. Mary's waggon road to the head of Lansdowne Creek. This new trail was located with easy gradients, and enables horses to carry a good load; at the summit it connects with a West Kootenay trail from Pilot Bay. The Moyie claims are near the old Walla trail, and can be reached either from Fort Steele or from Rykerts. Weaver Creek can be reached by a trail from Cranbrooke. All the claims on the east side of the Kootenay are reached from the steamer landings and the trunk road by comparatively short trails.

Windermere Mining Division.

Some of the claims on Findlay Creek are easy of access, others are situated beyond the trails.

A good cattle trail was completed in 1896, from the Columbia River, along Toby Creek and its North Fork to Hauser Lake in West Kootenay; there is also a trail up the South Fork to the summit of the Selkirks.

The claims on Horse Thief Creek are difficult of access at present. Short trails to Windermere mountains diverge from the trunk road.

Vermillion River, at the head of the Kootenay, is very difficult of access for reasons given above.

Golden Mining Division.

Bugaboo Creek is reached by a trail from Spillimacheen Landing, 50 miles by river from Golden. A trail from Carbonate Landing, 20 miles by river from Golden, reaches the claims on the three forks of the Spillimacheen; there is also a sleigh road from Vermont Creek on the South Fork to the North Fork Trail, and thence to Wells Landing on the Columbia River, 30 miles above Golden. There is a trail up Fifteen Mile Creek, from its mouth. A trail was constructed in 1896, from Golden Landing to a point on Canyon Creek, above the Canyon, and thence upward.

All these trails lead into the McMurdo Country, and will be a great help to the numerous prospectors who are likely to enter this division in 1897, as supplies can be packed in on horses to the very summit of the Selkirks.

Trails from the C. P. R. line, lead to the claims on the Kicking Horse and its tributaries.

Donald Mining Division.

A good trail, eight miles in length, was constructed in 1896, from Donald to Bald Mountain. The trail to Porcupine Creek, from a point on the C. P. R., between Donald and Beavermouth, is not in good order, but passable.

A trail is being constructed by yearly instalments from Bear Creek Station to Prairie Mountain. It is now practicable for men on foot with heavy packs, and it is intended to make it passable for horses in 1897.

A short trail from Beavermouth Station leads to the claims in that vacinity.

An expensive trail on the east bank of the Columbia leads from Donald to Kinbasket Lake. It has been little used lately, as prospectors have given very little attention to that section of the division.

MINING OPERATIONS IN EAST KOOTENAY, 1896, AS PER RECORDS.

Locality.	Locations recorded.	Certificates of work issued.	Mines held under Crown Grants.	Nature of Ore.
FORT STEELE MINING DIVISION.				
Mark Creek, St. Mary's River	34	33	4	Galena.
Perry " "	90	3	....	Gold.
Redding " "	3	4	......	Galena and copper.
Black Currant " "	5	......	......	"
South Fork, "	18	1	......	"
St. Mary's Lake, "	9	5	......	"
Middle Fork, "	8	6	......	"
West Fork, "	20	21	......	"
Lansdowne " "	2	......	......	"
Lapointe " "	6	......	......	"
Pyramid " "	14	1	......	"
Hell Roaring " "	5	2	......	"
Office " "	10	......	......	"
Moyie Lake	9	7	......	Galena.
Moyie River	6	1	......	Gold.
Weaver Creek, tributary of Moyie River	13	9	......	"
Sheep " " Kootenay River	2	......	......	Copper, galena.
Lewis " " "	22	9	......	Galena, copper.
Wild Horse " " "	21	35	......	Galena, gold copper.
Maus " " "	16	9	......	Grey copper, gold.
Lost " " "	12	8	......	"
Bull River, " "	9	9	......	Galena, copper, iron.
Land Creek, " "	8	4	......	Copper.
Elk River, " "	3	2	......	"
WINDERMERE DIVISION.				
Findlay Creek, western tributary of Kootenay	12	2	1	Galena, gold.
Toby " " Columbia	12	3	1	Copper, gold, galena.
Horse Thief " "	3	1	......	Copper, galena.
Windermere Mountain, east of "	6	......	......	Copper.
Vermillion River, head of Kootenay River	5	......	....	Ochre, copper.
GOLDEN MINING DIVISION.				
Bugaboo Creek, western tributary of Columbia	3	5	3	Galena, gold.
South Fork of Spillimacheen, " "	3	1	4	Galena, bismuth.
Middle Fork, " "	23	10	10	Gold, galena.
North " " "	25	2	......	Gold, galena, copper.
Fifteen-Mile Creek, " "	5	......	....	Copper.
Spillimacheen Mountain, near western bank, Columbia	3	3	4	Copper. galena.
Jubilee Mountain, " "	8	......	6	Galena, copper.
Steamboat Butte, " "	......	2	....	Gold.
Kicking Horse River, near C. P. R	19	5	1	Galena.
DONALD MINING DIVISION.				
Bald Mountain, south of Donald	17	......	......	Gold.
Porcupine Creek, "	......	2	......	"
Prairie Mountain, east of Glacier	7	1	......	"
Beaver River, "	4	......	......	Not reported.
Beavermouth, near C. P. R	3	......	......	Gold.
Kimbasket Lake, 30 miles north of C.P.R	......	2	......	Galena.
Blaeberry Creek, eastern tributary of Columbia	1	......	......	Not reported.
Total for East Kootenay	504	208	34	

WEST KOOTENAY.

(*See* Bulletins at end of Report.)

THE REVELSTOKE, ILLICILLIWAET, TROUT LAKE AND LARDEAU MINING DIVISIONS.

By J. D. Graham, Gold Commissioner, Revelstoke.

Returns from Mining Recorders.

	Revelstoke.	Illicilliwaet.	Trout Lake.	Lardeau.
Mineral claims recorded	135	64	208	128
Placer claims "	3	...	1	...
do re-recorded	1	..	...	..
Placer leases held	26	...	1	...
do applied for	9	...	1	...
Certificates of work recorded	28	33	93	20
Bills of sale recorded	77	39	80	28
Gold Commissioners' permissions recorded	24	3	...	...
Payments in lieu of assessment	...	...	...	1

Revenue Collected.

	Revelstoke.	Illicilliwaet.	Trout Lake.	Lardeau.
Free Miners' Certificates	$1,507	$275	$ 535	$271
Mining receipts	3,701.35	506.50	1,244.45	676.75

REVELSTOKE DIVISION.

Placer Claims—French Creek and Consolation Creek Claims.

This property laid idle during a portion of the year, through a dispute amongst the partners, but this has been settled, and since re-commencing work they have averaged about $200 a week in gold dust; a good showing when taking into consideration the fact that only one man is employed drifting out of the five men employed at the mine. Quantity of gold taken out since report, $1,600.

Honduras, *Nugget*, *Gold Hill*, *Chicago* and *Royal*.—These properties have been acquired by the French Creek Mining Co., registered, incorporated under the laws of the State of Michigan; capital, $2,000,000. No work has been done beyond testing the ground, with a view to installing a large hydraulic plant next year. A saw-mill plant is at present stored at Revelstoke for this company, having been received too late to be forwarded on to its destination.

The owners of this property took advantage of the amendment to the Placer Act, and paid in the amount in lieu of doing the necessary work, and they are sanguine that they are in possession of a good property, and intend installing a very large hydraulic plant next year.

Fairhaven, *Bellingham Bay* and *True Blue*.—These properties have had no work done on them this year beyond testing the ground, to find out the necessary plant required. The owners have notified me that they intend taking advantage of the amendment to the Placer Act, and pay in the amount in lieu of assessment work. They are very wealthy Chicago gentlemen, and intend installing a large plant this next spring, or working it with the French Creek Mining Co., which would be more advantageous to both parties on account of dumping ground.

Little Falls (creek claim).—This is considered to be good property, being an extension of the Consolation Mine.

McCulloch Creek.

Ophir Bed Rock Flume Co. (creek diggings).—This company have sunk a shaft through solid rock, 8 by 8 by 32 feet deep; run a tunnel 6 by 6, 72 feet in length, through solid rock, cross-cut through solid rock for 22 feet, and run up stream on vein rock for a distance of 75 feet; 8 men have been employed all the year, and about $400 in gold have been taken out. This company is at present on the bed rock of the creek, and it is expected will be repaid for all their trouble and expense in opening up this claim

North Star (creek diggings).—This claim will be worked all this winter. No gold has been taken out.

Camp Creek.

Imperial, *Unique*, *Senate.*—The owners of the Imperial claim sank a shaft on their property about 15 feet deep, but were driven out by the quicksands. The owners of the Unique and Senate have been working sinking shafts and putting in flumes, etc., with a view of opening up next season.

Goldstream.

Hidden Treasure.—Eight men were employed on this claim last winter, and took out about $400 in gold; since worked out.

Big Hole.—Four men were employed on this claim last winter, and took out about $800 in gold; since worked out.

Columbia River.

Columbia Hydraulic Mining Co. (*Reg.*).—This company installed an expensive hydraulic plant this year, which has proved a success; amount of gold taken out, $1,127.

Mr. Nason has been employed for two seasons superintending the work of the Columbia Hydraulic Mining Co.; at the same time he has devoted a good deal of his attention examining the various creeks as to their condition for hydraulic mining, etc.

Smith Creek.

Several claims were worked on this creek during the summer. No gold was taken out.

Four new leases were issued lately on this creek, and application made for seven more.

The British Columbia and United States Mining Co., an incorporated company, have made arrangements with holders of the various leases to work this creek as an hydraulic bedrock flume proposition, and have arranged to install a very extensive plant next spring. This will, no doubt, depend on transportation facilities; at the present time it is very unsatisfactory packing up supplies, but it is hoped that a steamer will be placed on the river from Revelstoke to Death Rapids, which will leave only about 20 miles of packing, instead of 60 to 70 as at present.

Mineral Claims.

McCulloch Creek, Ground Hog Basin.—This season the old time interest in the Big Bend country was partially revived, on account of the location of veins carrying free gold.

Thirty one claims in this basin were recorded during the season, in addition to ten others located late in the fall of 1895.

Assessment work was done on a few of the claims, and by all reports they have improved as depth was attained.

Many of the claims in this basin have been bonded to English capitalists, particulars of which are more fully set out later on.

Orphan Boy Mining Co.—The Orphan Boy mineral claim is situated on McColloch Creek, Big Bend district, and lies south-east of the Last Chance mineral claim, about 65 miles north of Revelstoke.

The officers of the company for the year 1897, are: Pres., J. W. Haskins; Vice-Pres., H. N. Coursier; Secy.-Treas., H. A. Brown; Directors, C. P. Carlyon and T. C. Whitney.

The company has sunk a shaft 45 feet, and run a drift 117 feet, the face of the drift is in solid ore, and shows up a lead of 10 feet in width, the assay value and mill tests of which are:—

	Gold.	Value.
No. 1 Assay, sulphurets of iron	7 ozs.	$ 140 00
" 2 " talc or casing	½ "	10 00
" 3 " decomposed quartz	3.6 "	72 00
" 4 " quartz showing no free gold	⅓ "	6 60
" 5 " cream quartz	64 "	1,280 00
" 6 mill test	1.96 "	39 20
" 7 " cyanide (silver, 2½ ozs.)		41 00
" 8 " tunnel rock		61 80
" 9 " "		29 60

The estimated quantity of ore on the dump now is 1,200 tons, average value of which is calculated at from $20 to $25 in gold per ton. The company are employing 9 men at the mine, at an average daily wage of $3, and intend, and have made arrangements, to vigorously prosecute the work with this staff all winter.

Negotiations are on with the Merrall Mill Company of San Francisco, for the erection of a 20-ton hydraulic quartz mill, as soon as it can be placed in the spring.

Ole Bull, *Rosebury*, *C. and D.*, *Big Bend Belle*, *O. K.*, *Golden Hill* and *Golden Eagle.*—The above claims have been bounded to Messrs. Erbsloh and Ferguson of London, England, the representatives of some English capitalists, for a very good figure ; 5% was paid down, and with the balance to be paid by the 1st November, 1897.

It was the intention of Mr. Erbsloh to have proceeded with development work this winter, but on account of the lateness of the season, Mr. LaForme the packer, could not manage to pack in their supplies, having all he could arrange to get up before the snow fell, which unfortunately, falling earlier than was expected, compelled Mr. LaForme to shoot all his pack train of over 30 horses, which was caught out in a very severe storm that formed a bad ice-crust on the snow ; a very serious loss to him, being the second time this has occurred in four years.

Mr. Erbsloh and his associates intend to push development work as soon as navigation opens, with a view of testing the properties. Two assays from the Big Bend Belle gave $42 and $34 in gold. Development work was done on six of the above claims, which show a good vein carrying free gold.

Beaver, *Holy*, *Magnet*, *Seattle*, *Little Lake*, *Bennett* and *Mammoth.*—The above claims are situate in Ground Hog Basin, and are bonded to the B. C. Exploration Co. of London, England, for a good round sum, and development work will be pushed as soon as supplies can be got in.

FRENCH CREEK.

Bella, *Golden Curry*, *Eric*, *Rose*, *Pearl* and *Silver King*.—These claims are all free gold propositions, and were bonded this fall at very good figures, to Messrs. McCallum and Potts, who intend pushing the development as soon as the spring opens up communications with the Big Bend.

DOWNIE CREEK—KEYSTONE MOUNTAIN.

Thirty-four claims were recorded this year in the vicinity of this mountain, which lies about 5 miles east of Boyd's Ranch, on the Columbia River, and about 4 miles south of the mouth of Downie Creek.

The claims on this mountain are covered with an iron capping, and on two claims upon which work was done, assays were obtained, one of 30½ ounces silver, 62% lead, and on another of a trace of gold, 41 ounces silver and 43½% lead. This is supposed to be an outcropping of the leads at the head of Downie Creek, which run in a north-westerly direction.

HEAD OF DOWNIE CREEK.

In my report last year, I made mention of some new discoveries at the head of the north fork of the Illicilliwaet, which turn out to be at the head of the south fork of Downie Creek. These properties, numbering 21, have turned out to be fully equal to what was expected. Mr. John Grant, of Detroit, Mich., has bonded 19 of these, and he is at present in London, England, making necessary arrangements to work them next year, while at the present there are seven men up there at work opening up two of the claims.

I enclose a copy of a report furnished me by Mr. Leak, M. E., who examined this property this year, and from inquiries I have made, he has not exaggerated the value of the properties.

Twelve claims were recorded this year in this vicinity, and assessment work was performed on seven claims.

Carnes Creek.

Homestake, *Hard Pan*, *Aberdeen*, *Roseberry*, *Salisbury*, *Arsenic* and *Imperial*. The above claims are owned by parties in Revelstoke, who have done considerable development work on them. Assays made this year show the quality of the ore as improving with depth, and running as high as $45 in gold, besides in silver. Most of these properties have been bonded to an English syndicate, and no doubt will be opened up next spring. There are other claims owned by parties in Seattle, which show up favourably with development work, and eight claims were staked and recorded on this creek this year. Carnes Creek has an advantage over many of the other claims in the Big Bend, in that the distance is only 28 miles from Revelstoke.

Jordon Creek.

Considerable development work has been done on the claims on this creek; they will doubtless be heard from next summer.

Near Revelstoke.

Early in July this year quite an excitement was raised by discoveries made on the hill at the back of Revelstoke of rock carrying gold, where 10 claims were recorded as located on the mountain, but the excitement soon died out, and little or no work was done on any of them.

I would beg to point out that lack of transportation facilities so far has acted as a detriment to the Big Bend country. This season opened very late, in fact the snow was on the mountains till July, then came the floods, that practically cut off all communication with the Bend for about 5 weeks by trail. This could be avoided by a steamboat running up as far as Death Rapids, by which it would be an easy matter to transport supplies to the various creeks flowing into Goldstream, that flows from the east into the Columbia above the rapid, above which point the trails follow the higher benches. There is a possibility of a steamer being put on the Columbia next season, to run above Revelstoke.

Considering the excitement in the Rossland District, which has been the Mecca of all mining men, this section has done fairly well when the shortness of the season is taken into consideration, and I have every confidence in this section. It is but a question of a short time when it will be found that the north end of West Kootenay is equal, if not superior, to any part of it, but as before stated transportation facilities are wanted for the rapid opening up of this part of Kootenay.

The section has not even as yet been prospected, alluvial diggings alone having been the principal thing looked for by the placer miner, for whom there is no fascination in quartz leads, only in the small particles of gold buried in the rivers and streams.

LARDEAU MINING DIVISION.

This division has not made as much progress as I had expected, considering the surface indications on the claims in this division, most of which carry gold, silver, copper and lead.

It is to be hoped that parties owning claims will open them up, or dispose of them at reasonable figures, to others who are willing to do so.

Sable Creek.

There are eight claims located on this creek, four of which are owned by the Sable Creek Mining Co., on which development work was done on the Agnes, the average assay of the ore being $21 in gold, 16% copper and about 60 ounces silver.

Boyd Creek.

There are about 20 claims located on this creek, on four of which assessment work was done, assays of these averaging 200 ounces in silver per ton, and a little copper.

POOL CREEK.

There are about 14 claims located on this creek. On the *Black Bear* a shaft has been sunk about 10 feet, showing a large body of ore. On the *Hunter* and *Trapper* a cut has been opened up for about 16 feet, which shows up a good body of ore carrying grey copper. *Wise West*, a cut on this claim, shows up a large body of ore of low grade.

LEXINGTON CREEK.

There are about 15 claims located on this creek. There are 9 claims on the Lexington lead; assessment work was done on 5 claims, and shows up a large body of low grade ore about three feet wide. The Silver Bow claim shows up a small body of very high grade ore.

On N. E. Arm.—There are about 20 claims recorded on this arm of Upper Arrow Lake.

Assessment work has been done on the *Young Canuck* and *Great Western*, which are concentrating propositions, and their ore is improving. This property is on the water front and easy of access.

Trout Lake Waggon Road.—Ten claims have been staked on this road. Assessment work has been done on the *Lucky Four*, which shows up pretty well.

On the east and west side of Upper Arrow Lake, about 21 claims have been located, they are all iron-capped and carry values in gold. On the *Mammoth* and *Haldon*, assessment work has been done, and they seem to improve with depth.

Galena Bay.—Eight claims are located on the Bay, all carrying gold, an assay of $44 in gold having been obtained from the *Royal Canadian*, while from two other claims, assays went $34 and $40 in gold respectively. No development work has been done on any of these claims.

ILLECILLEWAET MINING DIVISION.

Since my last report this section of the West Kootenay District has made a good deal of progress, more especially in the properties controlled by the Lillooet, Fraser River and Cariboo Gold Fields, Ltd., who are operating very extensively in this division, and the following is a detail of the operations of this company:—

THE LANARK.

At the *Lanark* mine previous to 1896 the vein had been tapped at three levels above the lowest or 400-foot level, though very little ore was shipped, owing to lack of facilities for getting it to the railroad, the ore shipped being packed at great inconvenience and expense down the mountain. Late in July a cross-cut was started in the lowest or 400-foot level, and about the middle of September the vein was struck. Owing to lack of room for storing ore, nearly every available space having been packed full in the mine from the development work, and it not being expedient to dump ore outside owing to snowslides, but very little work has been done in the vein at this level. A tunnel was driven in the vein sufficient to show that it is in excellent condition at this level, and an upraise was started to connect with the levels above, and has been driven up 120 feet along 3½ feet of solid galena of very high grade. The vein here is 25 feet thick or wide, out of which nothing has been taken except for the necessary opening for the upraise. In the No. 3 level the tunnel is being extended to connect with the upraise just mentioned, and at this point the entire face of tunnel is in solid galena.

At the *Isabella* mine, about the beginning of December a shaft was started about 100 feet from the mouth of the lowest tunnel, and by the end of the year will be down 35 feet, the ore from which runs 69 ounces silver per ton and 30 % lead. There is now in course of construction, and soon to be finished, an aerial tramway to be 6,550 feet in length, with a fall of 2,640 feet. The capacity of tramway at first will be 100 tons in 10 hours, to be increased to 150 tons in 10 hours by the addition of more carriers or buckets, and the capacity per day will then be 375 tons in 24 hours with 30 carriers of 500 pounds capacity, each running at a speed of 5 feet per second. The tramway is divided by an intermediate station into two sections of the same length and fall, and running by gravity develops a surplus of 11 h. p. The ropes in use, which have been specially made, are—

1 stationary carrying cable 1 $\frac{1}{16}$ diameter, 3,300 feet long, loaded side.

1 stationary carrying cable $\frac{7}{8}$-in. diameter, 3,300 feet long, empty side.

1 endless traction rope $\frac{5}{8}$-in. diameter, 6,600 feet long.

The longest span between towers is 2,900 feet. Breaking strain of ropes, 200,000 pounds per square inch.

There is also under construction a concentrator plant, the building of which is 50 by 130 feet. The machinery consists of rock breaker, three sets of rolls, elevators, revolving screens, with ten jigs, and four 6-foot Frue vanners. The power is furnished by two 8-inch and two 16-inch horizontal turbines, developing 200 h. p., and are connected to a 4 foot by 7 foot flume, giving 10 feet head; length of flume, 2,600 feet, running from a dam across the Illecillewaet River. The mode of ore treatment is known as coarse concentration, to which the Lanark ore is particularly favourable, sizing and separating. The nominal capacity of this mill is 100 tons in 24 hours, but the features of the Lanark ore are so favourable that this will be about doubled. Of the power mentioned above, 40 h. p. will be used for electric lighting and 60 h. p. for Lanark mine by electric transmission, to be used for mining operations as well as lighting the underground workings. A well equipped plant, with dynamos, is under construction. The whole concentrator plant has been constructed with a view to doubling the present capacity without disturbing any existing conditions, or without any additions to the tram or power plants. An assay office is being built, with a commodious laboratory and every convenience for assaying and analyzing the ore of the district. There is constructed and in operation a well equipped saw-mill, cutting lumber from the large quantity of good timber on the property. There is under construction, and nearly completed, a commodious store building, eight commodious 8-roomed cottages, an ample bunk-house for workmen; also office building to accommodate the different departments have been erected, and a boarding-house or hotel is being built which will have dining-room accommodation for workmen, as well as officials and other boarders. At the Lanark mine there is estimated to be in sight somewhere in the neighbourhood of 100,000 tons of ore, which will concentrate about three and one-half tons into one.

ROUND HILL.

On this claim, Crown-granted, there is a shaft 24 feet deep, showing in the bottom 8 to 9 feet of galena and carbonates, the assay values of which are, taking samples across the vein, (*a*) galena, $82.43 per ton of 2,000 pounds and 74 % lead; (*b*) oxides and clay containing carbonates, $16.43 per ton. Galena from another shaft 45 feet deep assayed $62.04 in silver with 62 % lead, all ore containing strong traces of gold. Still further north 150 feet a tunnel has been driven southward 40 feet on the vein of quartz and galena, and at the north end of this tunnel a shaft has been sunk 45 feet upon a vein, which at the bottom of the shaft shows a good foot-wall and hanging-wall 6 feet apart, while the ore is of a mixed character or pyrrhotite, chalcopyrite, blende, and galena. There is ample water power in the vicinity of this claim, which is less than a mile from the C. P. R. and about six miles from Illecillewaet in a north-westerly direction. There is plenty of timber on the claim for mining purposes; and lower in the valley the timber is of excellent quality for milling purposes.

DONALD.

On this claim, adjoining the Round Hill on the south, a shaft has been sunk to a depth of 84 feet, on which at the bottom are galena, pyrrhotite and blende, assays of which varying from $20 to $75 in lead and silver. A tunnel has been run in 165 feet, and will, when continued 250 feet further, cross-cut all the veins and meet the shaft at a depth of 208 feet.

FISH RIVER.

The *Dunvegan* mineral claim shipped 48 tons of ore to the smelter in San Francisco this season, the ore assaying 90 ounces silver and 72 % lead to the ton, netting a good profit to the owners, who have bonded the property for $15,000 with a probability of a sale being accomplished, as this is a good property.

The *Alma* mineral claim is a southerly extension of the Dunvegan, and will be developed next summer. It has a good surface showing, samples assaying 90 ounces silver and 72 % lead.

The *Scotia*, *Elizabeth*, and *Edinburgh* mineral claims, on the south-east side of Fish River, owned by the Fish River Copper and Silver Mining Company, have a good surface showing, and a tunnel has been run in 160 feet to tap the vein, but more work is to be done upon this property next season. There are ten tons of shipping ore ready for shipment, assays from which run from 175 ozs. to 320 ozs. silver, 80% lead; carbonates having assayed 1,207 ozs. silver, and $12 in gold per ton.

The *Annie* mineral claim is the southerly extension of the Scotia mineral claim, and a tunnel has been run 150 feet along the vein, with a fair showing of mineral, a good dump of shipping ore having accumulated, assaying 80 ozs. silver per ton, and 72% lead.

The *Agnes* mineral claim. the southerly extension of the Annie, also has good surface showings, assays from which giving 80 ozs. silver per ton, and 72% lead.

The *Heronback* mineral claim, the southerly extension of the Agnes, has a good surface showing of mineral, assaying 80 ozs. silver, and 72% lead.

On the *Salmon*, the southerly extension of the Heronback, there are also good surface prospects of mineral, assaying 80 ozs. silver, and 72% lead.

The seven claims as above mentioned are good properties, and are located upon a strong vein about 8 feet wide, carrying ore along the hanging wall, and there is a plentiful supply of timber and water.

On the *Blue Bell* mineral claim, situated about one mile south-east from Illecillewaet, and owned by Benjamin Green, the vein is 3 feet wide, in which a shaft has be sunk 45 feet deep in mineral, which assays 120 ozs. silver, and 72% lead, and this property is bonded, and will be developed next spring as soon as the snow disappears.

The *Silver Bow*, *Copper Crown*, and *Copper Hill* mineral claims, situated seven miles northerly from the C. P. R. R. at Flat Creek, and owned by the Fish River Copper and Silver Mining Company. A tunnel 90 feet has been driven in on the vein at one place, and a second tunnel, 70 feet long, lower down the mountain. The hanging wall is quartzite, the footwall green slate. Eighteen tons of ore were shipped in 1894, and netted the owners a good sum. Assays from this group gave 66% copper, $25 in gold, and 8 ozs. silver per ton. The company intend developing this property largely next summer.

On the *Sanquhar* mineral claim, situated about two miles from Illecillewaet, on the north fork slope, a shaft has been sunk 30 feet at one place, and about 12 tons of ore are on the dump, while at another point another tunnel is in 75 feet in a greenish rock, highly charged with copper pyrites and grey copper, carrying $1.50 per ton in gold. The galena from this property carries 111 ozs. silver, and 72% lead.

On the *Summit Lode* claim, the southerly extension of the Sanquhar, a tunnel has been driven in 75 feet, and in about another 20 feet will tap the hanging wall of the vein, the face of the tunnel being now in a greenish rock highly charged with copper pyrites and grey copper, the rock carrying $1.50 in gold per ton. Assays from the property give 111 ozs. of silver and 72% lead.

The *Jumbo* mineral claim, situated on the north fork slope, has an outcrop of a large vein, showing 9 feet of quartz at one place, in which one tunnel has been driven 130 feet upon a vein showing in the face 6 feet of quartz, highly mineralized, while another tunnel further down the mountain has been run 110 feet, showing a well mineralized face. Assays from this property of concentrates give 320 ozs. silver and $5 in gold per ton. There are good water power and plenty of timber adjacent to the property. There are supposed to be 180 tons of concentrating ore on the dump.

The *North Star* mineral claim, situated in Ground Hog Basin, about one mile from the Jumbo, has a good showing of Galena ore, and 10 tons of shipping ore lie on the dump, and a tunnel is being driven to tap the vein at a considerable depth. This property has been bonded to a Vancouver gentleman, who will commence work next spring as soon as the snow disappears. Assays of ore from this claim give 125 ozs. in silver, and 72% lead.

The *Georgie* and Reggie mineral claims situated about 19 miles from Albert Cañon on the north fork, and about 600 feet from the trail built this summer to Downie Creek, are owned by David and Emily Woolsey, and have been bonded for $10,000. Six men are working driving a tunnel 160 feet to tap the vein at a considerable depth. An assay of the ore from these claims gave 2 ozs. 17 dwt. in gold, 1,155 ozs. in silver per ton, and 13.9% copper.

The above information was furnished, as regards the Lanark and Isabella, by Mr. Brooks, local manager of the Lillooet, Fraser River, and Cariboo Gold Fields Co., Ltd., and, as regards the other claims, by Mr. Walter Scott, the present Mining Recorder at Illecillewaet.

TROUT LAKE MINING DIVISION.

Since my last report I am pleased to be able to state that this section has taken a step forward, and by all indications will be one of the best mining sections in the Province Experts who have examined the section all express themselves well pleased with the leads, which they state are equal to anything in the lower Kootenay country.

I enclose copy of Mr. Tom Taylor's (the Mining Recorder) report, which I think will give a very clear description of affairs in this camp during the season.

Mr. Taylor's Report.

Much outside capital has been interested in mining operations here, and considerable valuable work has been done during the last few months, but owing to the lateness of the season's opening-up, it was very late before operations could be commenced with any degree of activity. Nevertheless, it appears from the results already obtained that the bright future so often anticipated is on the eve of realisation.

The properties already taken up have been sold at very liberal figures, and several more changes are about to be consummated. Altogether, judging from present appearances we may safely predict that with the opening of communications in the spring this division will rank as another of Kootenay's producers.

Placer mining seems to have been almost entirely neglected, owing, no doubt, to the fact that a keener interest is being taken in quartz mining.

One of the greatest detriments to the camp has been the lack of transportation facilities. To partly overcome this, a sleigh road was projected and partially completed, connecting with Arrow Lakes at a point called Rosenheim, on Galena Bay. On the completion of this road, which is being constructed on railroad grade, a much shorter and better route will be laid open to the public, and will, for a time at least, answer the requirements of the camp. To the Lillooet, Fraser River, and Cariboo Gold Fields, Limited, is due the credit of this enterprise. As the company has ample means and are the possessors of some very rich and encouraging looking properties, which they are now developing, it is not at all unreasonable to suppose that, as their properties develop and as a speedier means of communication becomes an absolute necessity, they will ultimately connect their mines with navigation by rail; in fact, to this end engineers are now engaged making surveys.

Of the properties that are actually engaged in development, the Great Northern ledge seems to have taken the advance.

The Great Northern Group.

On this ledge there are eight locations, as follows:—*Silver Queen*, *True Fissure*, *Great Northern*, *Hillside*, *Broadview*, *Old Sonoma* and *Banff*.

The *Great Northern* and *Hillside* claims are bonded to a Montana Company. They have done during the past season about 300 feet of tunnelling, tapping the lead at different depths, and a splendid showing has in every instance been the result, with ore running from 18 to 200 ounces of silver per ton, 1 to 14% copper, and $2 to $12 in gold. About 200 tons of ore are now being forwarded to the smelter.

The *Broadview*, *Old Sonoma*, and *Phillipsburg* are bonded to the Lillooet, Fraser River and Cariboo Gold Fields Co., Ltd., which company is confining development work to the Broadview at present, where they have in the last five months expended $10,000. A shaft has been sunk to a depth of 85 feet on the ore, and levels are being extended to tap the vein in depth; but actual development work has only just begun, it being the intention of the company to keep a large force of men at work during the winter months.

Several hundred tons of ore are ready for shipment, the average value of which is about $100 per ton.

The old Sonoma has a cross-cut 60 feet, tapping the ledge, the average assay of the ore being 145 ozs. in silver, 7 copper, and $4 in gold per ton.

The *True Fissure* has had considerable surface development, the lead having been stripped and ore quarried 150 feet by 80 feet by 2½ feet deep, with some 600 tons of ore on the dump. Camps, outhouses, etc., are erected.

The *Silver Queen* has no development further than the annual assessment required, and looks extremely well on the surface.

The *Silver Cup*.—This mine has just forwarded a consignment of 20 tons to Tacoma Smelter; the average assay from which at the mine is about 400 ozs. silver and $18 in gold per ton. From 60 tons shipped some time since, the net result was $175 per ton.

A force of nine men has been employed since 1st October. The shaft in the ore has been sunk to 110 feet, and a 400-foot tunnel is now being driven to tap the vein at a depth of 100 feet below the present bottom of the shaft, 130 feet being now completed. Seven new buildings have been erected, and a new shaft-house and about three miles of rawhide trail and three miles of sleigh road completed. This property, also the Free Coinage adjoining, is the property of Messrs. Farrel and Dunn, of Vancouver.

The *Sunshine* and *Towser* claims are 1st and 2nd extensions on the Silver Cup, and have remarkably fine showings on the surface. The claims have recently been bonded to the Lillooet, Fraser River and Cariboo Gold Fields Co., Ltd., who are at present erecting winter quarters, etc., and when this work is completed a large force of men will be employed, and it is confidently expected that by next spring these claims will be in shipping shape. Samples of the ore taken from the surface, on the average, assaying in silver about 200 ozs. to the ton.

The *Badshot Group* consists of five claims situated in the lime belt and on the head-waters of Gainer Creek, and is a very promising group; on the Badshot claim a shaft has been sunk 100 feet, and a tunnel to tap the bottom of the shaft is now being extended. About 60 tons of ore, averaging in assay 225 ozs. silver, 75% lead and a small percentage of bismuth, are now ready for shipment. The vein at the bottom of the shaft is about 3 feet wide, with a rich pay-streak of 8 inches. Three men are engaged in developing.

The *Black Prince*, near the Badshot, has a tunnel about 200 feet long. The vein is from 9 to 18 inches wide, of a very high grade ore, and adjoining the Black Prince are the *Contact* and *High Grade* claims; good prospects, but with no development work done.

Gainer Creek empties into the South Fork of the Lardeau Creek, about ten miles from Trout Lake, and has its source at the foot of the lime belts, in which are located the Badshot Group, Black Prince and other well-known properties. South of this belt, for about four miles, is a succession of contacts, every thousand or two thousand feet, in each of which is a vein clearly defined for miles, making surface prospecting very easy, the formations being lime schists. The ore on the surface is galena, with some iron carbonates and oxides, but it is all of a rather low grade, and no development work has been done to demonstrate its value underground. About fifty locations were made in and about this creek during the past season.

The *Wagner Group*, near the head-waters of Haley Creek, has opened up very encouragingly for the amount of development work done. The ledge has been tapped in depth, and a solid vein of ore exposed two feet wide, assays from which run very high in silver, but, owing to lack of easy access, this group and the surrounding country have not had the attention that the surface showings and formations merit; however, on the opening up of other properties in the vicinity, no doubt, at no very distant date, better transportation facilities will be effected.

Francis Jewell Group, of four claims, is situated at the head-waters of Hall Creek and near the Wagner Group. No development work of any account has yet been done, but this and the Wagner Group are under bond to a Spokane syndicate.

Abbott Group consists of seven claims near the head-waters of Haley Creek. The Lillooet, Fraser River and Cariboo Gold Fields Co., Ltd., have a bond on these properties, on which they have drifted 400 feet, to tap a ledge at depth, but owing to its situation and inaccessibility (at this season of the year) development work for the present season has been suspended.

Duncan River above Hall Creek, which has been hitherto almost neglected, has, during the past season, been the scene of much active prospecting, and many good finds have been made, in all sixty locations having been placed on record in this office.

The *Pool Group* between the north and south forks of Lardeau Creek, consist of seven claims. During the past year very little has been done in the way of developing, but the ledge can be traced for a distance of two miles verying from twenty to forty feet in width, and is very heavily capped with iron. At a depth of 25 feet or 30 feet on the May Bee claim, some very rich specimens of native copper were obtained, the galena carrying from 20 to 40 ounces in silver and $6 to $12 in gold per ton. Negotiations are under way for the bonding of this group to an English company.

On the *Seven Mile Group* there are five locations, and on the *Black Eagle* about 60 feet of open cut and tunnelling have been done, the vein being about 14 inches in width, with average assays of 100 ounces in silver per ton.

North Fork of Lardeau Creek.—Several locations have been made on this creek during the past season, but the old locations have remained undeveloped, with the exception of the *Pilot Knot Group*, which has been tapped in depth by a tunnel 160 feet long. The vein has been exposed with about 18 inches of width, carrying 150 ounces in silver and some copper. Of the new locations on this creek, probably the most promising is the *Big Fire Group*, consisting of five claims, negotiations for a bond on which are now pending. Some very high copper-glance ore has been secured near the surface, and the lead is well defined and traceable for several thousand feet.

The *Horne Ledge* has 13 old locations and several recent ones. The lead is a very strong one, and very strongly capped with iron, and is traceable for miles, but it remains as yet entirely undeveloped.

The *Glengarry*, near the head-waters of the north fork of Lardeau Creek, is a very strong and well-defined ledge, and with an average assay value of about 140 ounces silver per ton and a fair percentage of copper, and on the same lead are the *Edna*, *Alice*, *Victory*, *Jim Dandy* and others, all very promising prospects.

The American is situated about 14 miles down Trout Lake from Trout Lake City, and has a vein of solid shipping ore of about 12 inches wide exposed. Considerable development work has been done, and a quantity of ore is now sacked for shipment, the grade being about $100 per ton. A bond is being put through with a Vancouver syndicate.

Trout Lake.—Several locations have been made near the shores of the lake, on veins carrying gold and copper.

Canyon Creek, at the foot of Trout Lake, has attracted considerable attention this year; eight locations have been made, and the ore from surface assays 160 ounces in silver per ton and 75% lead. The ledge is well-defined in the formation of granite and slate.

NORTH FORK OF THE ILLECILLEWAET.

By P. Leake, M. E., Revelstoke.

Previous to the year 1896, not much attention had been paid to this part of West Kootenay; but owing to the discovery of the Downie Creek properties, now owned by Mr. J. Grant, the Government has built a trail from Albert Canyon to the head waters of this creek.

On this trail several rich and extensive ore deposits have been discovered, among which we may mention, the *Grant Group* of claims on the head-waters of Downie Creek; the *Sir Walter* and adjoining claims, owned by Mr. T. McPherson; the claim owned and worked by Mr. Ben Green., etc.

Geology.—Proceeding along the trail in a north-easterly direction up the Illecillewaet River, we pass over an extensive belt of compact limestone, and continue in this formation until we reach the properties on Downie Creek. As we pass up the valley, large boulders of granite can be seen. To the east of the limestone a belt of granite traverses more or less the whole range, and the cropping can be found possessing various dimensions from Upper Kootenay Lake to the Big Bend.

The formation on both sides of this granite belt contain highly mineralized quartz veins; the granite is evidently intrusive, and appears to have had an intimate connection with the occurrance of the metalliferous deposits found in the adjacent areas on both sides of it.

The mineral belt, which passes from Kootenay Lake through Illecillewaet, Downie Creek, and north to the Big Bend, is extremely well-defined, and evidences of its existence occur throughout the entire distance. It is also a high grade belt, containing silver, gold, copper, lead, and as you proceed further north, nickel.

The Downie Creek properties occur in the stratified limestone a small distance west of the transition of the granite. This is a similar case to many of the Cornwall mines, where almost the whole of the mineral wealth of that country occurs within a distance of some two or three miles on each side of the junction of granite and killas, and to a marked degree is this seen near St. Just and St. Ives.

The veins found on the Waverly and Montague and adjoining claims on Downie Creek, are inclosed in walls of calcite, and a tunnel has been driven on the *Waverly* close to the hanging wall, showing a continuous body of highly mineralized ore (at this point about 6½ feet wide), composed of quartz, galena, tetrahedrite (grey copper), with some hydrous ferric oxide, resulting from the decomposition of iron pyrites, and occasionally stephanite (brittle silver) and cerargyrite (horn silver). Of six samples taken from this portion of the vein, the average amount of silver per ton was 104 ounces, some picked specimens running as high as 1,400 ounces per ton. The total width of the vein is about 40 feet, containing 9 feet of good ore, 6 feet on hanging wall and 3 feet on footwall, the vein, in conformity with others found in this district, having a north-westerly and south-easterly trend, and an easterly underlie of about 2 feet to the fathom The cropping can be traced for many claims showing it to be continuous and following its natural course; and about 1,600 feet west of this vein is also found a parallel vein, having the same course and dip, the ore being much of the same character, containing, however, more gold but a less percentage of copper. The *Tangier Claim* is on this vein, and assays taken went 100 ounces of silver and 1⅓ ounces gold per ton.

Owing to the richness of the ore found in such considerable quantities, the district is without doubt destined to become one of the most active camps in the Province.

From the *Sir Walter* and adjoining claims (16 miles from Albert Canyon) some very high silver assays have been obtained, viz:—300 and 1,000 ounces; the veins, however, are not so wide as the Downie Creek ones.

TRAIL CREEK DIVISION.

BY MR. JNO. KIRKUP, MINING RECORDER.

Mr. Kirkup submits the following information with reference to records, etc., for this division during the year ending December 31st, 1896, as follows:—

Records of Mineral Claims	2,588
Bills of Sale, Bonds, etc	2,690
Certificates of Work	1,211
Certificates of Improvement	93
Free Miner's Certificates	4,200
Number of claims working, about	175
Number of miners employed	1,500
Output of mines not obtainable	

SLOCAN DIVISION.

BY MR. A. SPROAT, MINING RECORDER.

The following are the statistics of the Slocan Mining Division for the year ending 31st December, 1896:—

Number of Records (location)	1,179
〃 Certificates of Work issued	749
Money paid in lieu of work on 12 claims	
Number of Bills of Sale recorded	1,170
〃 Bonds and Agreements recorded	106
〃 Certificates of Improvement issued	27
〃 abandonments recorded	25

NAKUSP SUBDIVISION.

By Mr. F. S. Farquier, Mining Recorder.

The following are the statistics of the Nakusp Record Office for the year ending 31st December, 1896:

Number of placer locations	1	
" quartz "	254	
" transfers recorded	169	
" claims or interests transferred	264	
" abandonments recorded	1	
" Certificates of Work recorded	127	
Average number of men engaged in mining	110	
Amount of revenue from Mining Receipts	$1,428	50
" " Free Miner's Certificates	1,052	00

AINSWORTH DIVISION.

By Mr. Jno. Keen, Mining Recorder.

Kaslo, B. C., 1897.

The following are the statistics from this office for the year ending December 31st, 1896:

Number of Mineral Claims recorded	813
" Certificates of Work	458
" paid $100 in lieu of assessment work	5
" documents recorded	571
" abandonments	21
" Free Miner's Licences issued	929

NELSON DIVISION.

By Mr. J. H. Rashdall, Mining Recorder.

The following are the statistics of the Nelson Record Office for the year ending December 31st, 1896:—

Number of Locations recorded	2,544
" Transfers	807
" Certificates of Work	323
" Free Miner's Certificates	1,138

GOAT RIVER DIVISION.

By Mr. J. G. Rykert, Mining Recorder.

There have been ninety (90) new locations made since January 1st, 1896, divided almost equally in Duck Creek, White Grouse and Sutter Districts in this division. There has been little more than assessment work done on any of these. On the locations made previous to this year nothing but assessment work has been done.

Cause.—The prospects are nearly all mined by parties unable to control capital, and having to work out to get money enough to do their work. There is no doubt that some of the richest ore found in West Kootenay has been found in this division. One claim I speak of as personally knowing carries ore assaying $72 in gold and 18 % copper to the ton, and no telling how wide the ledge is.

The ore all through the Duck Creek country so far worked carries gold in more or less quantities, and copper and silver.

It has been a very quiet season, as nearly all new comers went through to the Slocan or Trail country, and we have had very poor steamer facilities—one boat in two weeks.

I do not look for anything better until the Crow's Nest Pass Railway is built, as we are, as you might say, cut off from everyone and everywhere.

Report by Capt. Fitzstubbs, Gold Commissioner.

A long and carefully prepared report on this district was forwarded by Capt. Fitzstubbs, and also very full statistics on the mineral output, but as descriptions of these mining divisions are contained in Bulletins Nos. 2 and 3, and the data of the mine production had already been obtained, his report has not been embodied in this Report, except the statistical information from the offices of the Mining Recorders.

LILLOOET.

By F. Soues, Gold Commissioner.

Sir,—I have the honour to inclose herewith the Mining Statistics for Lillooet District, and my annual report for the year 1896:—

The total yield of gold from the district (ascertained from reliable sources only) is $33,665, showing a decrease from the annual returns for the last seventeen years, at least. The total ascertained district yield for the past 17 years is $1,185,023; an annual average of $69,707. It should be borne in mind that the above amount is really the returns of desultory work done by Chinese and Indians. There certainly have not been over half a dozen white gold-producing miners in the district during the year.

I attribute the low point reached in production to the discovery of rich gold-bearing quartz on Cayoosh Creek in April last, which caused a great influx of the mining element, all apparently having the one aim in view, the discovery and location of mineral claims, and as such were non-producers. With reference to the mining leases at and near Lillooet, reported last year as bonded to the Lillooet, Fraser River and Cariboo Gold Fields Co., I believe the whole of them have been abandoned.

Placer Mining.

Placer mining has been entirely neglected, and the same may be said in regard to hydraulic mining leases, with one or two exceptions. The mining claims on Scotty's Creek, referred to in my last report, were worked in the early summer, but as they have not been re-recorded I infer they are abandoned. Doubtless the boulder element to be contended with in that creek has again proved too strong for limited means and appliances.

Quartz.

Much excitement in this class of mining has prevailed since the location of a rich gold-bearing claim on Cayoosh Creek in April last, followed by the location of several claims on Poole Creek, Pemberton Portage, in June last, alleged to carry gold, silver and copper. I append sketch plans of the locations on both creeks, courteously furnished me by Mr. P. Burnet, Provincial Land Surveyor, who has been on the ground the greater part of the season, and may be taken as correct, and will serve to illustrate and locate my remarks in reference to the claims on both creeks. Dealing first with Cayoosh Creek:

CAYOOSH CREEK.

The whole of the claims recorded on this creek during the past year may, with the exception of the "Ample," "Whale," and "Gold Eagle," be dismissed with brief reference, as there has been no development work, except of the most superficial kind, done on any of them.

I regret to say that several of the latter class have been sold and re-sold. Speculation of this nature is not to be desired. We have world-wide proof, if proof were wanted, that it can only result in disaster to an infant industry in this district, not only to claims utterly worthless, but also to those that have proved their title to merit by development.

The present "Mineral Act" requires every one recording a mineral claim to *make oath* before the Mining Recorder that he has found "mineral in place." Let us have *value in place* also, proved by development, then sale or speculation.

The Golden Cache Mines Co.

With reference to the "Golden Eagle." In a personal interview with Mr. Noel, the Manager of the mine, he informs me that there are at present twelve men at work, and have been engaged in running a tunnel on the ledge, which is now in 66 feet. The tunnel is 6 feet wide by 7 feet, and is all in gold-bearing ore, uniformly distributed throughout its entire length. About 300 feet of the ledge has been uncovered, and taking this as a basis of calculation, and estimating it to contain similar gold-bearing ore to that in which the tunnel has been run, mining experts and others, I am informed, claim that there is at least a million dollars in sight. The gold in the "Gold Eagle" is contained in a matrix, exactly the same as that in several places in the "Bonanza" Group on the opposite side of Cayoosh Creek, and is described by Dr. Dawson in his report of 1895, page 99, as "the greater part of the rocks met with in the cross-section afforded by Cayoosh Creek may be described as black or blackish argillites, often lustrous, sometimes much wrinkled and corrugated, and occasionally micaceous with very fine mica. Many of them are more or less distinctly calcareous. Near the 'Bonanza' Mine a rather notable development of black and probably slightly graphitic argillites occurs."

The company now owning the "Golden Eagle" group of five claims, I am informed, have a ten-stamp mill ready to erect as soon as the road, which they are constructing from the end of the Government Road up Cayoosh Creek to their mine, can be finished.

The Bonanza.

Unfortunately the very severe snow-storm early in last month put a full stop to all work of that nature, and with little chance of it being resumed before March at least, as the snowfall was deep and we are liable to similar storms during the next two months. The other claims on this creek, which may be referred to, are the "Bonanza" group of six claims, located in the fall of 1887, and the "Ample" and "Whale." On these claims a considerable amount of development has been done, notably on the "Bonanza" group. The Lillooet and Fraser River and Cariboo Gold Fields Co. had a prospecting and development bond on the three lower claims of the "Bonanza" group last year, which is fully reported on by their manager, Mr. Hughes, in my last annual report.

This company's operations were confined to the lower claim, through which the creek runs, and were continued up to this spring, when the forces were withdrawn and put to work on the "Ample" and "Whale," and continued there the greater part of the summer, when work was stopped on them also. The time limits of the prospecting bonds with that company have expired with regard to both properties, without coming to further arrangements

HISTORY OF CAYOOSH CREEK.

A brief review of the history of Cayoosh Creek may not be out of place at this time. The miners arriving in this Province in its early mining history, 1858 and onwards, were largely from California, and the best of them with but a limited knowledge of placer mining, acquired in the previous decade from the discovery of the placer mines in California. Quartz mining was unknown then to the great majority of them.

They brought with them the erroneous impression that gold would never be found in payable quantities in the granite masses of the Cascade Range. In fact, gray-haired veterans can be found in the Province to-day who still hold that prejudice. Hundreds of these miners wintered in Lillooet, and thousands of them have passed by Cayoosh Creek to and from Cariboo. The gigantic mass of Mount Brew, to the south-west of the Town of Lillooet, and the granitic talus scattered from its base across Cayoosh Creek, and extending out to the north shore of Seaton Lake, there to be met by a similar formation, was sufficient evidence to the early gold-hunter in this Province to avoid Cayoosh Creek as worthless. Whether I am correct in this hypothesis is immaterial, the fact remains that it continued untouched and in a state of nature until the spring of 1886, when a flock of Chinese quietly settled down on it, and Mr. Phair, Mining Recorder, reported to me in December of that year that he had recorded for them 190 claims, and for white miners 16, and Mr. A. Smith reported to me at the same time that during that year he had bought 725 ounces of Cayoosh Creek gold, adding his belief that there was as much more in the hands of the Chinese miner. In 1887, parties here grubstaked two miners, and sent them out to endeavour to locate the sources of the gold found in the creek. They left here in August of that year, and followed the north-west side of the creek some 15 or 20 miles miles above the Chinese claims, but without finding anything, either in the creek or mineral in place. They returned by the south-east side of the creek, and at a point within the lines of the "Mary Ann" claim, on Mr. Burnet's plan, discovered a large boulder, composed of quartz and slate, which had evidently been broken off the mountain-side high above them. Without appliances to break the boulder, they built a fire on it, and after heating it well, poured water on it, and thus broke it up, when gold was easily to be seen in it. It was an easy matter then to trace the line of descent, and after a little search the place was found on the "Bonanza" ridge, at a point between the second and third location up from the river, and where gold-bearing specimens could be found here in abundance.

The prospectors returned here, and the six claims were recorded on the 12th September, 1887. The find soon leaked out, and the next claim recorded was on the 26th October of that year, about 2,000 feet above the creek, and nearly opposite the "Bonanza," and afterwards abandoned. From that time on to spring of this year a few claims were annually recorded, as a rule only to be abandoned, without any attempt at development or exploration. In December, 1887, Mr. A. W. Smith reported his purchases of gold for that year at $65,696, a large proportion of which was from the Chinese claims on Cayoosh Creek. In 1888 his purchases amounted to close on $60,000, seven-eighths of which was estimated to be from Cayoosh Creek. In 1889 the amount bought by Mr. Smith dropped to $39,000, with the exception of about $100 worth, all bought from the Chinese miner. Summed up, the Chinese were the discoverers of gold in Cayoosh Creek. From Mr. Smith's accurate returns, we find that he bought from them in three years gold amounting to, in round figures, say $103,000. To be well within the mark, allow one half of that amount as carried away by them, and we have a total of $154,500 for the three years. The whole of this was taken from, say five miles of the creek, and all below the line of the "Bonanza" group.

Resultant on the discovery of the river claims was a lease issued to the Vancouver Enterprise Co., situated below the limits of Mr. Burnet's plan. This company was formed for the purpose of diverting the river from the present bed, and working it and its surroundings to bed-rock. Numerous obstacles to this plan came in the way, the company spent a large amount of money in various plans for development, and finally bonded their lease to the Lillooet, F. R., and Cariboo Gold Fields. This company spent a good deal of time and money in exploration and development, and put in powerful pumps to enable them to reach bed-rock, but failed in the undertaking. That part of the creek bed, ancient and modern, is still unknown.

This is the history of the creek from its discovery to the present time. From my observations, there are three kinds of gold in the creek, the finer kind uniformly distributed through the ore found in the "Golden Eagle." The coarser and richer specimens, found in the onanza" group, and the still coarser specimens found in the river bed workings by the inese, some of them going as high as $70. It is a well established fact, I think, that coarse d, released by whatever agency from its rocky matrix, moves but a short distance, even in ift running rivers. In the "Golden Eagle" and "Bonanza" group are the sources of at st a portion of the two first named kinds. In my opinion, the source of the third kind has , yet been located, and most likely will be found below the line of Cottonwood Creek.

Facilities for Mining.

I have referred to the *geological disturbances*, that are in striking evidence everywhere on yoosh Creek, in former reports, and again draw attention to them. Mr. Hughes, in his ort to me last year, also refers to them particularly.

I would infer that quartz mining on this creek will be beset with many difficulties, which l require careful thought and skilled management in dealing with and overcoming them. blanket ledge will be in evidence, possibly rich, but suddenly vanishing or twisted out of pe and lost for a time. Wide areas of the numerous small quartz veins and auriferous ists may be worked profitably, on the open face or quarry system, and in turn they will be ked by intrusive dykes of worthless material. It is evident that if the infant industry of rtz mining on this creek, beset as it is by the numerous natural obstacles as indicated, is e placed on a remunerative and lasting basis, the whole matter cannot be too carefully lt with now. I need not point out that the reckless speculation, to give it the very mildest n, indulged in for the past few months, aggravated by the almost total absence of develop- nt, will never accomplish this, and, if continued, will inevitably result in adding another ie to the long list of mining failures in this Province.

With the modern application of electricity to mining, the value of Cayoosh Creek, as a ive power, cannot be overestimated. Timber for mining purposes and fuel, in the ghbourhood of the mines is none too plentiful, and, from the very rugged nature of the ntry, will always be difficult to get at, and form a very large item of expense, in any ertaking there. The Cascade Range, locally known as the Cascades but in reality the ern margin of the "Coast Range" of mountains, is here broken by a deep valley commencing illooet and ending at the junction of Fraser and Harrison Rivers, approximately about miles in length. Cayoosh Creek has its source in Duffy Lake, a small sheet of water ated in a deep gorge on the eastern side of the valley described, and almost in the centre. mile or two west of Duffy Lake, the water-shed flows to the west, falling into Lillooet Lake, finally reaching the Fraser River at Harrison mouth). From the lake it flows through a row and winding lateral valley of the eastern Cascades, falling into the Fraser below the n of Lillooet, at an elevation of 692 feet above sea level. Where it passes through the nanza" group the elevation is 1,300, shewing a rise of say 600 feet in 10 miles. From a t a short distance above the "Bonanza," the rise would not average as high in the next miles. In August, 1863, I made the ascent to the summit of the Cascade Range, to a point t and immediately above Duffy Lake, and from the amount of piled and apparently etual snow, that late in the season, I have no hesitation in saying that the supply of water ayoosh Creek will never fail.

Poole Creek, Pemberton Portage.

The discoveries of minerals on this creek were made in June last, and all come within provisions of the "Mineral Act" of last session of the Legislature.

The first recorded claims are said to be on ledges, with a seam width of from 40 to 60 ; hanging wall, slate; foot wall, granite; and reported to Mr. Phair, Mining Recorder, as g wonderfully rich in gold, silver and copper I am not aware that there has been any lopment work of any moment, done on any of these locations, the width of seams and the re of hanging and foot walls may therefore be taken with reservations. "Poole Creek" nore properly "Birkenhead River," is situated on the old Pemberton Portage, and about 50 s south-west from Lillooet, and is situated on the western slope of the Cascades, the waters irkenhead River falling into the upper Lillooet River, and thence into Lillooet Lake. I that Mr. Burnet in his sketch plan, has given the name of "Blackwater" to the group of ns already recorded, and for the sake of brevity in future, that name, perhaps, should be red to. I am not aware that any geologist of note has ever visited this section. My own recollection of it, after 30 years, is a confused mass of granite mountains, towering aloft to the line of perpetual snow. Ingress to Blackwater, at present, is from Lillooet, *via* Seaton and Anderson Lakes and Pemberton Portage. It can also be reached from Howe Sound by a very rough trail.

BONAPARTE VALLEY.

Mineral Claims.—The first claim located in this valley was recorded in July of last year. Mr. Ahearn, the owner of that location, reports to me that he has run a tunnel 35 feet by 5 feet by 7 feet, the greater portion timbered, the nature of the ore, sulphide, iron chlorides, sulphur, arsenical iron and silicates, carrying gold, silver and copper. The character of the formation generally diorite and porphyry. Between walls 51 feet, contacts dolomite, lime and quartzite. Assays made from the ore gave gold, $1.20; silver, 3 to 78 ounces; copper, 6 per cent. Mr. Ahearn proposes running in one hundred feet, and then cross-cutting to walls. A group consisting of 8 claims, situated further down this valley, were located in July last, by the British Columbia Development Co.; and Mr. Ogilvie, the resident manager, furnishes me with the following information:—"The claims are situated on what may be termed a large blow-out of porphyry and quartz. The ore is tetrahedrite and galena. Active development commenced at the end of August last. Tunnel No. 1, driven in 101 feet; tunnel No. 2, 65 feet; Humming Bird tunnel, 191 feet; shaft sunk, 44 feet. We have struck a vein in the Humming Bird tunnel, in the "Avoca" claim, and also the same ore in shaft. The sample of the former gave 42 ounces of silver, and copper 18.04% per ton, and the sample of the latter, 50 ounces silver, and copper 22.80% per ton. A good bunk-house, magazine and blacksmith's shop have been erected, and everything in good shape for the winter, and indications seem to be improving as work progresses on the mines."

The development work done on this group of mines is in marked contrast with that of a similar nature in any other portion of the district during the past year. Dr. Dawson, in his report for 1895, page 85, describes at length the geological conditions existing in the above portion of Bonaparte Valley.

BIG SLIDE QUARTZ MINES.

This property has changed hands during the past year. Seven claims have been located on the supposed line of the lode in the Big Slide, late in the season, but no development work has been done on them.

On Bridge River eight mineral claims were located during this month, but no work has been done on them.

HYDRAULIC MINING LEASES.

With the exception of the Bridge River Gold Mining Co.'s claims on the Horseshoe Bend, Bridge River, and the Mulholland & Co. claim on the South Fork of that river, no work has been done on any of the leases in the district.

DREDGING LEASES.

In my report of last year I stated that this class of mining in my district was "an unsolved problem," and I regret that I must again repeat it. One company only commenced work early in the season at a point on the river immediately below the bridge near Lillooet, and were met by numerous difficulties, the most serious of which was the wire cable required to span the river was found to be short, necessitating a new cable 1,100 feet in length, which had to be brought from Eastern Canada, and caused great delay. Their plant is worked by a 12-horse power engine. Having made a start it was then found that the belts slipped as soon as the load of gravel was lifted above the surface of the water, and they were again compelled to stop work until they can procure a chain belt to run in cogs, with which appliance the company believe the plant will work satisfactorily. So far they have been unable to prove that there is gold in the river bed where they have commenced work.

BRIDGE RIVER.

I have for years past, notably in 1886 and 1889, endeavoured to draw attention to this (in my opinion) the richest, and at the same time most neglected, portion of the district, and may at this time and place be permitted to refer to it at length. Referring to the very imperfect Provincial map, a line drawn from the junction of Big Creek with Fraser River to the headwaters of Jervis Inlet, would form the centre of the locality to which my remark will refer. I also append sketch plan of Bridge River from Fraser River to the South Fork, the data for which is furnished me by Mr. McDonald, District Road Superintendent, who is well informed as to that portion of the river. I am not aware that this portion of the Province has ever been visited by any of our eminent geologists, and trust that Mr. Carlyle, Provincial Mineralogist, may be able to pay it a visit in August next (the best time), and give us the benefit of his scientific knowledge.

From a personal residence of 34 years in the district, at Pemberton, Lillooet and Clinton, and during the whole of that time, with exceptional opportunities of learning the amount of gold obtained and the localities, I may be supposed qualified to deal with the matter intelligently and correctly. With the decade ending 1869 official public reports, with regard to mines and mining in this district, are conspicuous only by their absence. The early miners into this Province, 1859-60, worked their way up the Fraser River, testing all the tributaries for gold. Bridge River in those years was located and worked, and from that time on to the present, by white, Indian and Chinese miners, year by year, with varying success. The richest finds and largest nuggets were obtained in the decade referred to. With the decade ending 1879, we have official mining statistics, commencing in 1874, in some of which annual reports place has been found for Lillooet District and the estimated returns. In others the district has been entirely ignored.

From 1860 to the discovery of Cayoosh Creek, Bridge River has been the principal source of the gold obtained. If the old mercantile books of Mr. Smith, Mr. Foster, and other traders doing business in Lillooet in the sixties, and the records of the now almost forgotten Dietz & Nelson express line, then carrying express and treasure between Victoria and Lillooet, could be now examined, the result would be a very startling array of figures of the amount of gold obtained from Bridge River and the Fraser River benches and bars in the immediate neighbourhood of Lillooet. In the early sixties the principal workings were from the mouth up to the head of Deep Canyon, from which point the river flows through a long marshy section some 50 miles. The river bed here is smooth, sandy, with fine gravel, in which only fine colours have been found. Above this stretch, Tyaughton Creek has produced considerable coarse gold. Gun Creek so far has produced only fine gold, and in limited quantity. Coarse gold is found in Cadwallder Creek and the South Fork. Mr. A. W. Smith showed me a sample of 6 ozs. of very coarse gold, which he bought from an Indian last week, whose claim is located at a point above Gun Creek, and below Cadwallder Creek. The lower 13 miles of the river is now covered by an Indian reserve, sketch plan of which I append, and the wisdom of thus practically locking up so much of a well-known auriferous stream may be questioned. The valley of Bridge River for a considerable distance is paralleled by the valley in which are situated Seaton and Anderson Lakes, and at one point on Seaton Lake the distance to Bridge River, at Jack's Landing, is only about six miles. The division between these two valleys is a high and much broken up ridge of mountains, with numerous streams (not shown on the Provincial map), falling into the above-named lakes.

The whole of the creeks, notably McGillavray Creek, are auriferous. The ridge of mountains referred to widen out to the south-west, reaching a summit, on the south side of which the watershed is to the head of Birkenhead River, on which the "Blackwater" claims have been recorded this year. In 1864 I was shown gold by an Indian, which he found at the headwaters of Lillooet River. On the north-western side of the line first referred to, gold has been found in various places. (*See* my report for 1886.)

It will be noted from the foregoing brief and imperfect references that Bridge River and its tributaries have been in places highly auriferous, with a possibly barren zone above the deep canyon, and further that it has a wide-spread surrounding of mineralized rocks. The gold found in the river is unmistakably different to that found in the Fraser River bars and benches, and in form and size of the pieces bears a strong resemblance to the gold found in the placer workings in Bendigo, Victoria, in the early fifties, with this difference, that Bridge River gold shows much more recent release from its rocky matrix, in fact, at least one-third of the pieces still hold imbedded pieces of quartz.

In other lands, placer mining has, with few exceptions, whether in wide areas of alluvial deposits, in ancient or modern river beds, led up to the discovery of the rocky matrix, from which the alluvial gold was obtained. Placer deposits, in a few years, led to the discovery of the famous Comstock lode. Placer deposits located the Treadwell mine on Douglas Island.

The fabulously rich placer mines of Ballarat and Bendigo, discovered in 1851, in two years located the reefs, some of which on Bendigo, have "lived down" over 3,000 feet, and been continuously worked for over 40 years. The experience on Cayoosh Creek, shews that in little more than one year, the matrix, of at least a portion of the gold found in the creek, was located.

I have shewn that the bed and tributaries of Bridge River have added to the golden wealth of the District and Province for the past 36 years, and after all these years, we are yet unable to show from whence this annual supply has come. It must be borne in mind that the great majority of the miners working on the river for the past quarter of a century, have been Indians and Chinese, and whose efforts are invariably directed to the river banks and adjacent benches. A limited number of white miners have annually been at work, but their energies have been persistently directed to the river bed, schemes for diverting its course for a short distance, and hydraulic mining, involving a large expenditure, with, too often, no results. During the mining season, it will always be a difficult stream to deal with, on account of the volume of water it carries, and as a rule, a heavy fall along the line of all known auriferous portions of the bed and banks. The topography of the river and its water-shed need hardly be referred to here, a repetition of Cayoosh Creek, on a larger scale, the greater portion is at a high attitude, all more or less subject to summer frosts, and unfit for agriculture. The usual broken up and rugged nature of the Cascades prevails, access to it is by the primitive and often dangerous trail from the mouth of the river, or by trail from Seaton Lake, over a high divide to Jack's Landing. Doubtless this want of easy access, has, in the past, been an obstacle to the development of that part of the District.

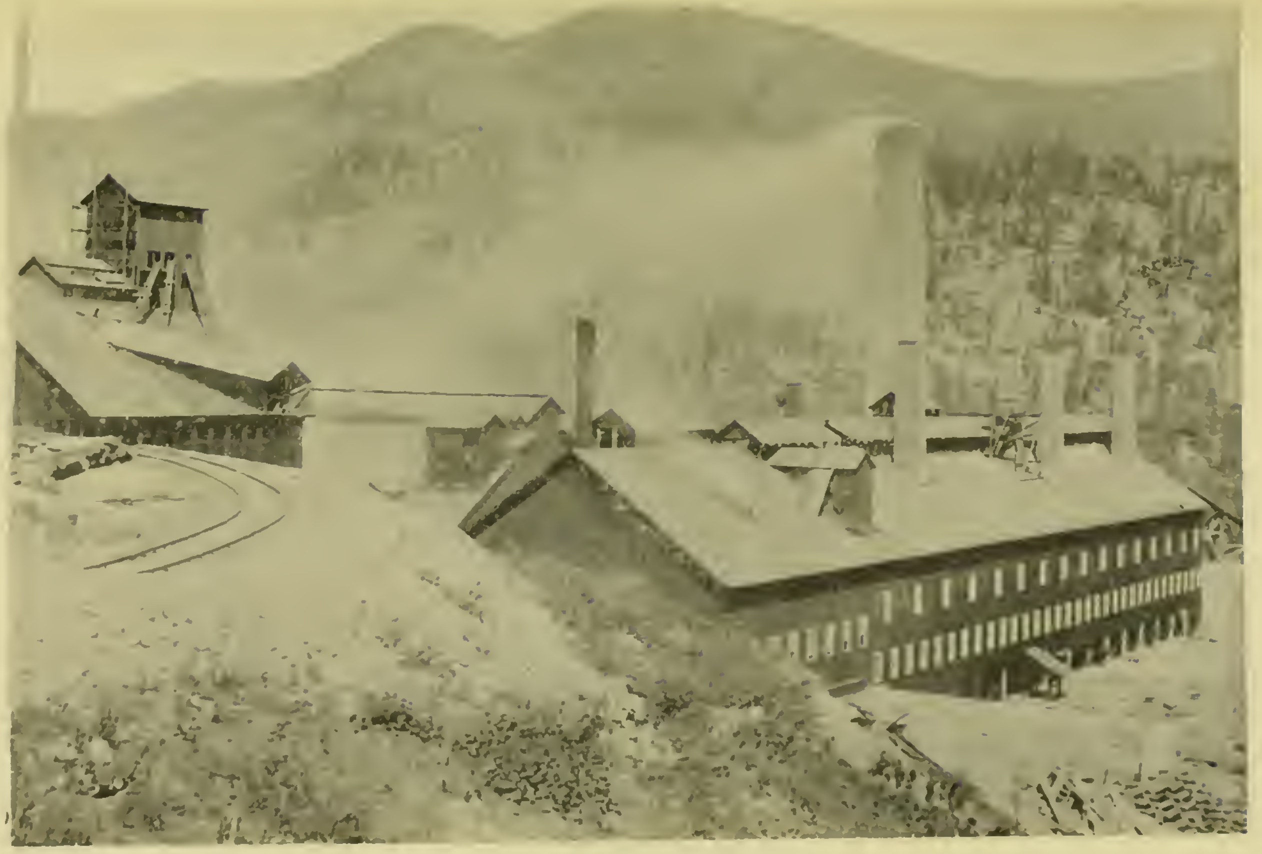
INDIAN RESERVE ON BRIDGE RIVER.

I have no hesitation in asserting that, for every dollar obtained from the bed of the Cayoosh Creek, twenty dollars have been taken from Bridge River, and would indicate for careful prospecting for the matrix which undoubtedly has furnished the supply found in the lower river from its earliest history, a radius taking in from the head of the deep canyon, the lower portion of the North Fork and Horse-Shoe Bend, down to the line of the Indian Reserve. Of course, time and energy need not be wasted on the 13 miles of the Indian Reserve, as under the present Mineral Act, the locator of a mineral claim must make oath, that it is not situated within "any Indian Reservation." The history of the river up to the present, is, that there is a long sluggish stretch from the head of the deep canyon, for nearly 50 miles in which nothing but fine colours of gold have been found. Above this is a wide spread zone, embracing Tyaughton, Gun and Cadwallder Creeks, and the South Fork, all auriferous and yielding a quality of gold identical with that found in the lower river, and I would infer that, within this zone, careful prospecting should be made for the lodes, which undoubtedly have furnished the supply found in the beds of the above-named streams. In addition to gold, I have already shown that silver and galena have been found in the neighbourhood. Copper and float pieces of cinnabar have also been found at different times. In brief, the whole of that portion of the district, from Blackwater Camp on the south-east, to Chilco River on the north-west, thence by the Chilcotin River to Fraser River, with the latter as a base line, is practically unknown territory from the prospector's point of view, with the exception of portions of Bridge River, one of the main central arteries. Of the existing geological conditions nothing whatever is known, so far as I know.

Five mineral locations were made on Cadwallder Creek in October last, and three others this month, in the neighbourhood of the Horseshoe Bend, but all too late for any development at this season. The Horseshoe Bend is under lease to the Bridge River Gold Mining Co., who propose commencing a tunnel, as soon as the season will permit, to run from the lower to the upper caulk of the shoe. The tunnel will be about 800 feet in length, and, when the river is diverted into it, will lay bare and dry the curve of the shoe, about ⅝ of a mile. The river benches at this point are covered by hydraulic mining leases, from the upper part of the Indian Reserve to the North Fork. Although not within my province, I may be permitted to urge the necessity of a road as a means of ingress to the Bridge River Valley, and as a base to fall back on, and I believe there are no engineering difficulties in the way to the construction of a waggon road from the mouth of the river to the North Fork, a distance of about 16 miles.

COAL.

In this class of mining there has not been anything done, and no prospecting licences have been issued for the district this year.



SMELTING WORKS AT TRAIL, B. C.

(See page 18, Bulletin No. 2.)

The following abstract shows the mining transactions in Mr. Phair's office at Lillooet, and my office here, for the year:

Recorded	Mineral Claims	220
Conveyances of	"	87
Abandonments	"	3
Certificates of Work	"	16
Water Grants for	"	3
Recorded	Placer Claims	9
Re-recorded	"	7
Conveyances	"	10
Water Grants recorded	"	8
Dredging Leases in force		13
Hydraulic Mining Leases in force		31
" " applied for		7
Free Miner's Certificates (Revenue)		$1,067 00
Mining Receipts, general "		1,108 65

NANAIMO DISTRICT.

Marshal Bray, Gold Commissioner.

I have the honour to submit my first annual report for the Nanaimo Mining Division for the year ending 31st December 1896, with the customary statistics.

The information is rather meagre at this early stage of development, as nearly all the mineral claims in this district were located in 1896. I only had 22 records of mineral claims in this office at the end of the year 1895, and in August, 1896, Texada Island records were transferred to this office from New Westminster office, and 100 records were so transferred.

For the first year this Mining District has made a good showing, which is as follows:—

303 mineral claims recorded.
367 free miner's certificates issued.
34 certificates of work recorded.
3 certificates of work issued.
95 conveyances of mineral claims recorded.
3 water grants issued.
2 leases of mining lands for hydraulicing issued.
1 placer mining claim recorded.

The assays from the rock taken from many of the claims show gold and silver in paying quantities, and a few claims show copper and lead, but, as 1896 being the first year, not much development work has been done; in fact, on most of the claims no more has been done than the necessary assessment work required to hold the claims; but no doubt the year 1897 will record the development of many valuable gold and silver mining properties in this district.

The following mineral claims have done considerable development work during the year 1896:—

The Van Anda, on Texada.—A shaft has been sunk 60 feet to first level, and the level has been run 100 feet, and the shaft has been sunk 30 feet below the first level, and they are now stoping out rock for shipment. This claim is about one-half mile from Sturt Bay, which is a good safe harbour, and is connected with the mine by a good road. The company are preparing to put up a wharf. The company has shipped a few tons of ore to Tacoma to determine the value of the ore, and it has run from $25 to $50 per ton.

The *Victoria* group of claims, on Texada Island.—A shaft has been sunk 50 feet on the ledge, and it assays well.

The *Raven*, on Texada Island, are running a tunnel, with good results.

The *Silver Tip*, on Texada Island.—A shaft sunk 60 feet on good ore.

The *Lorindale*, on Texada Island.—A shaft sunk 35 feet, and another shaft sunk 20 feet, both being on good ore.

The *Nutcracker*, on Texada Island.—A shaft sunk 18 feet on good ore.

The *Bobby Burns*, on Valdes Island.—They have run 80 feet of tunnel on good ore.

The *Hetty Green*, on Valdes Island.—They have run 100 feet of tunnel on good ore.

The *Daniel Webster*, on Valdes Island.—They have a shaft 40 feet deep on good ore.

The *Poodle Dog*, on Channe Island.—They have run 80 feet of tunnel on good ore.

The above-named claims on Valdes and Channe Islands show a vein of about 6 feet wide running through them, and a shipment to the Tacoma smelter gave returns of $31.20 per ton, and they will soon be steady shippers.

The *White Pine*, on Thurlow Island.—They have run 125 feet of tunnel on good ore.

On the *Alliance* group, in Dunsmuir District, they have sunk one shaft 50 feet deep, and one shaft 16 feet deep, and run 35 feet of tunnel, all in good pay ore.

There are two other companies in Dunsmuir District who have taken out tools and provisions, and intend putting in the winter in developing their properties. This portion of the district badly needs a trail from the east end of the Nanaimo Lakes and along the north shore of said lakes, and thence on to the Nitinat River; the distance is between 25 and 30 miles. You will perceive by my statement enclosed that there are 82 mineral claims recorded out there, and there is no trail to take in provisions and tools.

Mr. Dick, the Inspector of Mines, intends making a personal inspection of many of the mineral claims in this district, and he will be able to give you in his report a more detailed and satisfactory report as to the nature of the rock, ores, etc., etc., than I am in a position to give, as I have not been able to spare the time to make a personal inspection, and have had to get my information from the owners of the claims and others who have seen the several claims I have mentioned.

VICTORIA MINING DISTRICT.

VICTORIA DIVISION.

By W. S. Gore, Gold Commissioner.

I have the honour to hand you herewith a report upon the mining transactions which came within my jurisdiction during the last year. This is the first report of the kind that I have had the pleasure of presenting. Heretofore there have been but very few mining locations made on the coast, and the claims which had been recorded were not prospected with any very satisfactory results; it is therefore gratifying to note the comparative magnitude and importance of the past year's transactions. I have also appended a complete detailed list of all the Crown Grants for mineral claims which have been issued by the Government up to the date of this report, which will be a matter of public interest and convenience, as will also be the list of Gold Commissioners and Mining Recorders, which is annexed.

No. of Free Miner's Certificates issued	690
″ Mineral Claims recorded	342
″ Placer ″ ″	25
″ Certificates of Work	60
″ Certificates of Improvement	1
″ Grants of Water Right	13
″ Lay-overs	11
″ Placer Leases	22
″ Conveyances	83

Revenue Derived.

From Free Miner's Licences	$3,460 00
" Mining receipts generally	3,117 10
Total	$6,577 10

The mineral claims above referred to, are situated principally in the vicinity of Phillip Arm and Loughborough Inlet, and at various other points on the coast of the Mainland, also on the southern portion of Vancouver Island, and consist chiefly of gold, silver and copper, in combination of varying proportions. Nearly all of the mining locations in Victoria District are easy of access by water, and the prospects for successful mining at these places during the ensuing season are bright.

NEW WESTMINSTER DIVISION.

Heretofore this has not been regarded as a mining district of any importance, and the number of claims taken up has been small. Notwithstanding the transfer of Texada Island from this to the Nanaimo District, the number of claims recorded at the office of Mr. Robson, Mining Recorder, during the past year, has been beyond all precedent, and the other business in connection with the office has correspondingly increased, as will appear from the following comparative statement:—

	1895.	1896.
Free Miner's Certificates issued	168	1,150
Mineral Claims recorded	182	518
Certificates of Work issued	12	37

Conveyances, from 1889 to 1896, 81; during 1896, 81.

As a majority of these claims have been located during the latter part of the year, very little development work has been done yet, and one cannot speak with any certainty respecting the actual value of these mining properties. Generally the rock is low grade, but reports of assays in several cases have been very encouraging; some of the claims located on Harrison Lake having shown over $200 in gold to the ton. The Mineral locations are spread over a large area, including Harrison Lake and River, Glacier Lake, Mission, Chilliwhack, Sumas, Stave Lake, Pitt Lake, Burrard Inlet, Howe Sound, Squamish River, Malaspina Strait, Jarvis Inlet, Powell Lake, and elsewhere adjacent to the Straits of Georgia and Fraser River. The amount of prospecting done during the summer has been very large, and there is every reason for expecting that a considerable amount of development work will be done during the coming summer.

For some time negotiations have been going on, looking to the establishment of a smelter and refinery at Vancouver or New Westminster, but no definite arrangement has yet been concluded. Such an establishment would greatly tend to stimulate the development of local mines, as it would probably reduce the cost of treating the ores. A large proportion of the claims located in this district are adjacent to navigable waters, and the ore could be laid down at very small cost, either on Burrard Inlet or Fraser River; and if a smelter were in operation at either of these points, the low grade ores could be worked at a profit. The mining outlook in this division for 1897 is very hopeful.

CROWN GRANTS ISSUED FOR MINERAL CLAIMS TO JANUARY 1st, 1897

ALBERNI.

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
Golden Eagle	Alberni	H. Saunders	51 65	Section 198	31st Oct., 1895
Okolono	"	"	51.65	" 199	" "
Sechart	Clayoquot	F. J. Claxton *et al*	20.66	" 3	30th Mch., 1892

CARIBOO.

American	Cariboo	B. C. M. & M. Co	19.88	Lot 92, G. 1	1st Nov., 1889
Burns Mountain M. Co.	"	Burns Mountain M. Co	61.98	" 62, 63, 64, "	25th Feb., 1885
Cariboo	"	B. C. M. & M. Co	20.60	" 93 "	1st Mch., 1889
Consolidated	"	C. D. Rand	....	" 200 "	11th Dec., 1894
Eureka	Richfield	"	20.66	" 201 "	" "
Gifford	Cariboo	"	20 66	" 198 "	" "
Quesnelle Quartz M. Co.	"	Quesnelle Quartz M. Co	113.30	" 52, 53, 54, 55, 56, G. 1	16th Sept., 1884
Rand	"	C. D. Rand	20.66	" 117 "	16th April, 1890
St. Laurent	"	B. C. M. & M. Co	2.00	" 94 "	1st Mch., 1889
Victoria	"	C. D. Rand	20 66	" 199 "	11th Dec., 1894
Wilkinson	"	B. C. M. & M. Co	20.66	" 177 "	25th May, 1893

EAST KOOOTENAY.

Atlanta	....	E. B. Osler *et al*	19.47	Lot 134, G. 1	9th Sept., 1889
Agnes	Golden	M. Drainard	20.66	" 764 "	18th April, 1895
Buckhorn	Fort Steele	North Star M. Co	19.47	" 679 "	17th May, "
Black Horse	Golden	M. Drainard	18.90	" 763 "	18th April, "
Constance	....	E. B. Osler *et al*	19 42	" 135 "	9th Sept., 1889
Diamond E	Golden	Carbonate Mountain M. Co	20.66	" 543 "	16th May, 1893
Dreadnaught	Fort Steele	North Star M. Co	51.65	" 660 "	17th " 1895
Horse Shoe	....	A. Granger	20.66	" 266 "	15th Dec., 1891
International	Golden	J. F. Armstrong	20.66	" 661 "	11th Nov., 1895
Jumbo	Windermere.	Wm. Rosamond	20.66	" 293 "	7th June, 1892
Juanita	Golden	D. Oppenheimer *et al*	20.66	" 652 "	29th Oct., 1894
Monarch	"	Geo. deWolf	20.66	" 551 "	30th May, 1893
Maud S.	"	Geo. Gore	20.66	" 649 "	15th Sept., 1893
Mountain Daisy	"	S. Redgrave	19.80	" 647 "	" "
Monitor	"	F. Dick	20.66	" 651 "	" "
Mill Site	"	R. Fotheringham	5.00	" 1091 "	10th Feb., 1896
Midnight	Fort Steele	Geo. Hoggarth	41.50	" 1381 "	15th Dec., "
Number One	Golden	Carbonate Mountain M. Co	20.66	" 542 "	11th May, 1893
North Star	Fort Steele	North Star M. Co	51.65	" 657 "	17th " 1895
Nugget	Golden	H. E. Foster	51.65	" 777 "	5th Dec., "
O. K	Fort Steele	North Star M. Co	51.65	" 658 "	17th May, "
Rothschild	Golden	S. Redgrave	20.56	" 136 "	27th Sept., 1889
Robert E. Burns	"	R. Fotheringham	51.65	" 1002 "	5th Dec., 1895
Southern Cross	"	Carbonate Mountain M. Co.	20.08	" 544 "	16th May, 1893
Silver King	"	S. Redgrave	16.00	" 648 "	15th Sept., "
Standby	"	Wm. D. McKay	20.45	" 761 "	29th Oct., 1894
Syenite Bluff	"	H. G. Low.	20.66	" 672 "	19th Mch., 1895
Thunder Hill	Windermere.	Jas. Brady	20.66	" 253 "	16th Nov., 1891
Tiger	Golden	Jno. McKay	20.66	" 650 "	15th Sept., 1893

WEST KOOTENAY.

Name of Claim.	District.	Name of Grantee	Acres.	Description.	Date of Grant
American Flag	Nelson	Chas. Hall *et al*	6.55	Lot 142, G. 1	1st Dec., 1890
Ayesha	Ainsworth	E. W. Herrick *et al*	16 47	" 143 "	13th Feb., 1891
Arkansas	"	B. Roberts *et al*	14.00	" 173 "	7th Feb., 1891
Annie	Nelson	H. Selous	14.00	" 407 "	20th Mar., 1893
Antelope	Slocan	Jno. King *et al*	49.93	" 452 "	5th Dec., 1893
Alpha	"	Wm. Brady *et al*	51.67	" 562 "	1st Nov., 1894
Amazon	Ainsworth	A. V. Westly	20.66	" 713 "	10th Dec., 1894
Alamo	Slocan	N. D. Moore	33.12	" 737 "	4th Jan., 1895
Arcade	Ainsworth	A. B. Hendryx	18.00	" 722 "	28th Mch., 1895
Abbott	Trout Lake	H. Abbott	51.65	" 765 "	14th Jan., 1896
Adams	Slocan	Adams & Brandon	50.78	" 750 "	26th Jan., 1896
Annie	Trail	D. J. Burke *et al*	30.20	" 730 "	20th May, 1896
Alberta	"	D. M. Drumheller	43.71	" 973 "	3rd July, 1896
Alice	"	Ema R. Rugh	43.71	" 945 "	27th July, 1896
Atlantic Cable	"	Wm. Caldwell	29.61	" 1206 "	25th Sept., 1896
Attended	Ainsworth	A. W. McCune	18.37	" 978 "	3rd Dec., 1896
Blue Bell	"	W. A. Hendryx	20.60	" 50 "	15th Feb., 1888
Banker	"	A. D. Wheeler	20.65	" 147 "	3rd Sept., 1890
Black Bird	"	A. W. McCune	20.66	" 174 "	23rd Jan., 1893
Blue Bird	Slocan	J. A. Whittier	51.65	" 540 "	8th April, 1893
Best	"	D. Porter *et al*	20.66	" 451 "	4th Sept., 1893
Bobtail	Ainsworth	Shafer G. & S. M. Co	30.00	" 556 "	21st Nov., 1893
Blue Jay	Slocan	R. E. Lemon *et al*	17.42	" 482 "	8th May, 1894
Buffalo	"	A. Sproat *et al*	33.16	" 674 "	6th April, 1894
Britomarte	"	R. C. Adams	44.52	" 698 "	10th Aug., 1894
Black Chief	Ainsworth	Columbia M. Co	20.13	" 569 "	12th Nov., 1894
Bon Ton	"	W. H. Brandon *et al*	14.08	" 636 "	17th May, 1895
Black Bear	Trail	Le Roi M. Co	49.15	" 538 "	6th Feb., 1895
Badger	Goat River	C. M. Reese *et al*	19.70	" 785 "	11th Feb., 1896
Brandon	Slocan	Brandon & Adams	35.30	" 751 "	26th Feb., 1896
Bid	Nelson	Hall Mines Co	14.50	" 901 "	18th Mar., 1896
Buckeye	Trail	Schmidt *et al*	15.00	" 534 "	30th April, 1896
Blue Bird	"	E. Bousquet	29.53	" 1053 "	"
Beechwood	"	H. Bostock	47.40	" 938 "	28th July, 1896
Boomer	"	Caledonia C. M. Co.	0.25	" 961 "	14th Oct., 1896
Big Chief No. 2	"	McCraney *et al*	45.42	" 1284 "	7th Dec., 1896
Bugaboo	Ainsworth	A. W. McCune *et al*	15.52	" 979 "	3rd Dec., 1896
Comfort	"	Geo J. Ainsworth	20 35	" 12 "	9th Dec., 1884
Crow Fledgling	"	A. D. Wheeler	20.66	" 146 "	3rd Sept., 1890
Corbin & Kennedy	Illecillewaet	D. W. Corbin, *et al*	20.66	" 200 "	7th Dec., 1891
Crystal	"	"	20 66	" 203 "	"
Copper King	Nelson	E. D. Ainsworth	12.27	" 417 "	1st April, 1893
Centre Star	Trail	O. Durant *et al*	20.66	" 558 "	27th Nov., 1893
Cumberland	Slocan	M. Clair *et al*	32 74	" 478 "	20th Mar., 1894
Chamblet	"	R. C. Adams	41.77	" 699 "	12th April, 1894
Crescent	Ainsworth	Columbia M. Co	20.66	" 568 "	12th Nov., 1894
Calcium	"	A. B. Hendryx	2.25	" 721 "	16th Mar., 1895
Currie	Slocan	J. H. Currie	26.50	" 744 "	30th Aug., 1895
Cons. St. Elmo	Trail	J. R. Cook *et al*	14.52	" 924 "	11th Feb., 1896
Cliff	"	"	15.55	" 921 "	15th Jan., 1896
Crown Point	"	C. Dougherty	30 45	" 981 "	21st July, 1896
Columbia	"	Trail M. Co	16.00	" 694 "	25th Feb., 1896
City of Spokane	"	Ed. Haney	19.80	" 804 "	6th Mar. 1896
C. & C	"	J. C. Gore	12.50	" 992 "	27th May, 1896
Crown Point	Slocan	Wm. Braden	7.60	" 586 "	20th Oct., 1896
California	Trail	Chas. Warren *et al*	51.65	" 956 "	24th Sept., 1896
Cumberland	Nelson	Ed. Mahon	20 24	" 904 "	19th Aug., 1895
Commander	Trail	Commander M. & S. Co.	51.65	" 960 "	25th Sept., 1896
Cariboo	"	Kendrick & Ogilvie	46.82	" 1205 "	"
Caledonia	"	Caledonia Con. M. Co	20.29	" 734 "	14th Oct., 1896
Clifton	Slocan	J. M. Harris *et al*	41.21	" 517 "	22nd Oct., 1896
Dandy	Nelson	Fox, Kelly & Cook	19.30	" 141 "	12th Sept., 1891
Democrat	"	M. D. Mahoney	8.75	" 236 "	"
Dictator	Ainsworth	Empire Con. M. Co.	20.66	" 243 "	22nd Dec., 1891
Danira	"	J. C. Rykert, Jr	14.35	" 259 "	31st Dec., 1891
Dellie	"	S. S. Bailey	18.50	" 241 "	23rd Jan., 1893
Dardanelles	Slocan	Jno. King, *et al*	47.61	" 453 "	5th Dec., 1893

WEST KOOTENAY.—*Continued.*

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
Deadman	Slocan	R. M. Sherman	40.72	Lot 613, G. 1	29th Oct., 1895
Deerborn	Nelson	Wm. Strachan	20.66	〃 390 〃	5th Dec., 〃
Deer Park	Trail	F. A. Mulholland	51.65	〃 932 〃	12th Feb., 1896
Daylight	Nelson	Hall Mines Co.	39.30	〃 907 〃	20th May, 〃
Delaware No. 1	Trail	Delaware M. & M. Co.	51.65	〃 1225 〃	28th Oct., 〃
Evening	Nelson	Geo. W. Coplin	20.66	〃 103 〃	27th Feb., 1891
Etna	〃	C. Van Ness	4.02	〃 414 〃	19th Oct., 1893
Eden	Ainsworth	Columbia M. Co.	19.80	〃 567 〃	12th Nov., 1894
Echo	Slocan	Grady, Briggs & Latz	51.60	〃 719 〃	11th Feb., 1895
Early Bird	Ainsworth	J. L. Retallack	10.63	〃 566 〃	14th Aug., 〃
Evening Star	Trail	D. M. Drumhellar	18.37	〃 801 〃	5th Nov., 〃
Enterprise	〃	S. St. Onge *et al.*	20.65	〃 695 〃	17th Jan., 1896
Eddie J	〃	D. C. Corbin	44.00	〃 803 〃	27th Feb., 〃
Elanore	〃	Argonaut G. M. Co.	24.00	〃 951 〃	30th April, 〃
Excelsior	Nelson	W. Dainard *et al.*	51.65	〃 1107 〃	27th May, 〃
Elgin	Slocan	Minnesota S. Co.	51.65	〃 742 〃	21st July, 〃
Ellen	Ainsworth	Jno. H. Fink *et al*	14.20	〃 980 〃	4th Dec., 〃
Eric	Trail	Eric G. M. Co.	43.19	〃 1277 〃	1st Dec., 〃
Forest	Nelson	J. R. Cook *et al*	14.00	〃 233 〃	4th Sept., 1891
Fourth	Ainsworth	Geo. C. Howe	17.75	〃 301 〃	1st June, 1892
Freddie Lee	Slocan	Freddie Lee M. Co.	15.11	〃 475 〃	13th Aug., 1894
Ferne	Nelson	F. Fletcher *et al.*	51.65	〃 374 〃	23rd April, 1896
Franklin	Slocan	E. O. Carpenter	44.90	〃 588 〃	22nd July, 〃
Fergus	Ainsworth	A. J. Marks	20.66	〃 977 〃	4th Dec., 〃
Freeburn	Trail	Freeburn M. Co.	25.90	〃 957 〃	〃 〃
Grizzly Bear	Nelson	R. A. and A. C. Fry	20.25	〃 105 〃	2nd June, 1891
Golden Wreath	〃	Cottonwood G. M. Co	20.66	〃 495 〃	23rd Mar., 1893
Golconda	Ainsworth	Kootenay M. & S. Co	22.00	〃 726 〃	15th 〃 1895
Golden King	Nelson	Cottonwood G. M. Co	20.66	〃 496 〃	23rd 〃 1893
Great Western	Slocan	Thos. McGovern	20.66	〃 548 〃	29th May, 〃
Grand View	Nelson	A. H. Kelly	19.49	〃 685 〃	4th Mar., 1895
Golden Drip	Trail	T. M. Dormitzer	9.00	〃 539 〃	2nd 〃 〃
Gertrude	〃	A. Beamer	16.80	〃 690 〃	4th Oct., 〃
Gold Hill	〃	R. C. Daniel	51.65	〃 640 〃	10th Dec., 〃
Golden Chariot	〃	A. Jackson	46.00	〃 691 〃	9th Mar., 1896
Great Western	〃	〃	12.08	〃 692 〃	〃 〃
Great Eastern	Slocan	W. C. Yawkee	46.49	〃 753 〃	30th April, 〃
Georgia	Trail	H. H. R. Chapman	41.48	〃 928 〃	9th May, 〃
Gem	〃	A. B. Campbell *et al*	37.31	〃 984 〃	22nd 〃 〃
Grey Copper	Slocan	J. A. Whittier	17.68	〃 580 〃	27th July, 〃
Goodenough	〃	J. H. Thompson *et al*	8 30	〃 581 〃	14th Aug., 〃
Giant	Trail	G. W. Coplin	42.00	〃 997 〃	28th Sept., 〃
Golden Queen	〃	Jas. Garrison	39 00	〃 994 〃	〃 〃
Gold King	〃	D. M. Lennard *et al*	38.05	〃 1061 〃	〃 〃
Gold King	〃	L. J. McAter	11.80	〃 1229 〃	8th Dec., 〃
Goldendale	Nelson	O. Bordau	13.47	〃 915 〃	15th 〃 〃
G. R. Sovereign	Trail	G. W. Peterson *et al.*	42 85	〃 1226 〃	14th 〃 〃
Happy Find	Illecillewaet	Corbin, Kennedy *et al*	20.66	〃 202 〃	7th 〃 1891
Highland	Ainsworth	J. C. Rykert *et al*	15.26	〃 258 〃	31st 〃 〃
Hendryx No. 1	Slocan	Kootenay M. & S. Co	20.96	〃 461 〃	1st Aug., 1895
Hendryx No. 2	〃	A. B. Hendryx	21.50	〃 462 〃	15th Mar., 〃
Hidden Treasure	Nelson	Colwell *et al.*	17 57	〃 411 〃	20th 〃 1893
Highlander	Ainsworth	M. Stevenson	20.66	〃 557 〃	14th Nov., 〃
Hannah	Nelson	W. Strachan	20.14	〃 371 〃	4th Jan., 1895
Homestake	Trail	S. M. Wharton *et al*	19.87	〃 936 〃	27th Feb., 1896
Henry	Ainsworth	Harman & Hendryx	10.71	〃 724 〃	6th Mar., 〃
Hattie Brown	Trail	Meade & McLaren	35.00	〃 1047 〃	16th 〃 〃
Highland	〃	M. S. Thompson *et al*	50.65	〃 1049 〃	30th April, 〃
High Ore	〃	High Ore M. & S. Co.	24.40	〃 641 〃	〃 〃
Hattie	〃	E. Bousquet	32.00	〃 1054 〃	〃 〃
Iroquois	Nelson	J. E. Boss	15.13	〃 234 〃	14th Sept., 1891
Ivanhoe	〃	W. R. Will *et al.*	14.02	〃 416 〃	20th Mar., 1893
Idaho	Trail Creek	Durant & Tarbet	19.56	〃 559 〃	27th Nov., 〃
Idaho	Slocan	Behne *et al*	50.24	〃 472 〃	27th April, 1894
Ivy Leaf	〃	R. McFerran	7.33	〃 738 〃	4th Jan., 1895
I. X. L	Trail Creek	G. Pahl *et al*	19.47	〃 679 〃	12th July, 〃
Iron Horse	〃	S. St. Onge	18.00	〃 795 〃	16th Jan., 1896

WEST KOOTENAY.—*Continued.*

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
Ida	Trail Creek	C. Schmidt *et al*	19 00	Lot 989, G 1	21st May, 1896
Iron Mask	"	Pat. Clark	11 60	" 688 "	18th May, "
Ida Fraction	"	C. Schmidt *et al*	12.27	" 990 "	6th Aug., "
Ivanhoe	Slocan	Minnesota Silver M. Co	29 24	" 743 "	24th July, "
Ida No. 2	Trail Creek	J. A. Mulrony *et al*	44 8	" 1060 "	28th " "
Josephine	Ainsworth	Josephine M. Co.	20 66	" 552 "	20th Nov., 1893
Jay Gould	"	Shafer G. & S. M. Co	19 88	" 554 "	21st " "
Jim Crow	Nelson	E. Mahon	17 38	" 469 "	14th Feb., 1894
Josie	Trail Creek	F. C. Loring	14 00	" 536 "	11th Jan., 1895
Jessie	Nelson	E. Mahon	15 60	" 686 "	20th May, "
Jumbo	Trail Creek	J. A. Finch *et al*	20 66	" 965 "	12th Nov., "
John W. McKey	Slocan	E. H. Thomlinson	51 65	" 968 "	4th Mar., 1896
Jim Fair	"	"	30 17	" 969 "	" "
Josie Mae	Trail Creek	Sam. T. Arthur	35 80	" 1230 "	4th Dec., "
Kootenay Chief	Ainsworth	Geo. J. Ainsworth	18 40	" 11 "	9th Dec., 1884
Kootenay Bonanza	Nelson	Chas. Hall *et al*	20.66	" 140 "	1st " 1890
Krao	Ainsworth	A. D. Wheeler	20 66	" 93 "	15th Jan., "
Kootenay	Trail Creek	P. Aspinwall	20 45	" 697 "	23rd Dec., 1895
Koo i-noor	Nelson	Hall Mines Co., Ltd.	10 24	" 245 "	13th Nov., "
King William	Trout Lake	H. Abbott	51 65	" 766 "	14th Mar., 1896
Kaslo	Ainsworth	Jas. Smith *et al*	50.56	" 822 "	Not issued.
Kalmar	Slocan	Wm. Lardner	48 38	" 1012 "	8th Dec., 1896
Kalispell	"	Wm. Lardner *et al*	37 2	" 1011 "	" "
Lulu	Ainsworth	G. J. Ainsworth	19 30	" 13 "	9th Dec., 1884
Little Donald	"	J. F. Stevens *et al*	20 66	" 92 "	16th Jan., 1890
Let her-go, Gallagher	"	A. D. Wheeler	20 66	" 87 "	15th " "
Le Roi	Trail Creek	Le Roi M. & S. Co.	20 29	" 240 "	23rd Dec., 1891
Libby	Ainsworth	A. W. McCune *et al*	20 66	" 178 "	4th May, 1892
Last Chance	Nelson	E. Mahon	10 20	" 410 "	14th Feb., 1894
Lulu	"	E. Ramsay	18 20	" 247 "	4th April, "
Little Phil	Ainsworth	Thos. McGovern	4 1	" 477 "	3rd Oct., "
Last Chance	Slocan	E. H. Tomlinson	16 32	" 717 "	25th Feb., 1895
Londoun	"	J. M. Harris *et al*	35.80	" 727 "	5th Oct., "
Lizzard	Goat River	J. H. Field *et al*	20.66	" 786 "	11th Feb., 1896
La Belle	Trail Creek	J. B. Jones *et al*	9 96	" 729 "	30th April, "
Londonderry	"	Argonaut G. M. Co., Ltd	17 00	" 952 "	" "
Last Chance	"	A. B. Campbell *et al*	31.00	" 986 "	22nd May, "
Lake Side	Nelson	Hall Mines Co., Ltd.	45 18	" 906 "	20th " "
Lilly May	Trail Creek	O. Bordan *et al*	11 89	" 1052 "	21st July, "
Lost Boy	"	H. Bostock	29 00	" 942 "	28th " "
Little Pittsburg	"	"	43.50	" 940 "	" "
Long Tom	Nelson	E. A. Powys *et al*	48 03	" 386 "	15th Dec., "
Lucky Queen	Trail Creek	Paul Blackmar	2 48	" 1184 "	14th " "
Lanark	Illecillewaet		16.35	" 294 "	Not issued.
Maestro	Ainsworth	A. D. Wheeler	20.66	" 90 "	15th Jan., 1890
Majestic	Nelson	Jno. Miles	20 66	" 402 "	5th Sept., 1892
Minnie	"	John McDonald	.87	" 246 "	23th Jan., 1893
Mountain Chief	Slocan	S. S. Bailey	8.17	" 498 "	17th Mar., "
Maid of Erin	"	"	9 97	" 500 "	" "
Mile Point	Ainsworth	Julia A. Wright	20.00	" 214 "	14th July, "
Mountain Chief No. 2	Slocan	W. H. Smith	51 65	" 474 "	19th Sept., "
Mill Site (Rattler)	Trail Creek	E. D. Carter	5.00	" 560 "	3rd Nov., 1894
Mountain View	"	E. S. Topping *et al*	45 65	" 682 "	11th May, 1895
Mountain Boomer	Slocan	E. & H. Mahon	47 86	" 740 "	23rd Sept., "
Mill Site	"	N. D. Moore	5 00	" 736 "	20th " "
Monte Cristo	Trail Creek	S. St. Onge *et al*	16 53	" 802 "	17th Jan., 1896
Mill Site	Slocan	Byron N. White Co.	5	" 590 "	9th April, "
Morning Star	Trail Creek	A. Cessford *et al*	38 63	" 955 "	3rd " "
Mammoth	"	A. B. Campbell *et al*	20 10	" 985 "	22nd May, "
Magnolia	"	H. Bostock	25 40	" 943 "	28th July, "
Mill Site	Nelson	The Hall Mines Co., Ltd.	5.00	" 910 "	30th Sept., "
Monita	Trail Creek	Monita G. M. Co. of B. C.	16 80	" 689 "	
E. W. B	Ainsworth	T. J. Lendrum *et al*	19 14	" 716 "	10th Dec., 1894
Morning	Nelson	Geo. W. Coppen *et al*	18 85	" 104 "	27th Feb., 1891
Number One	Ainsworth	Revelstoke Mining Co.	20.66	" 89 "	25th Jan., "
New Jerusalem	"	J. Frank Collom	19.00	" 144 "	1st Sept., "
Newmarket	Nelson	J. R. Cook *et al*	12 65	" 235 "	14th " "

WEST KOOTENAY.—*Continued.*

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
Neosho	Ainsworth	Neosho Mining Co	14.89	Lot 302, G. 1	8th July, 1892
Nickel Plate	Trail Creek	E. Haney *et al*	18.80	″ 537 ″	3rd May, 1895
No. 1.	″	A. H. Sonneman *et al*	16.38	″ 687 ″	27th Dec., ″
Northern Belle	″	J. A. Finch	29.50	″ 644 ″	30th April, 1896
North Star	″	Frank Barnard *et al*	25.00	″ 797 ″	6th Aug., ″
Nest Egg	″	Nest Egg M. Co., Ltd	45.37	″ 1048 ″	10th Nov., ″
Novelty	″	Thos. F. Wren *et al*	19.61	″ 958 ″	30th Sept., ″
New Denver	Slocan	Jno. M. Harris *et al*	28.75	″ 612 ″	22nd Oct., ″
Ollie	Nelson	Kelly *et al*	21.04	″ 412 ″	20th Mch., 1893
O. K	Trail, B. C.	John J. Cole *et al*	31.18	″ 678 ″	20th April, 1895
Old Abe	Goat River	John H. Field *et al*	14.39	″ 783 ″	11th Feb., 1896
Olla Podrida	Trail Creek	Frank C. Loring	34.47	″ 799 ″	2nd April, ″
Ohio	Ainsworth	R. S. Howard *et al*	9.4	″ 974 ″	9th April, ″
Ontario	Trail Creek	G. E. Pfunder *et al*	49.27	″ 1057 ″	21st July, ″
Old Timer	Ainsworth	Rich. Ashworth	11.73	″ 250 ″	29th July, ″
Pataha	″	A. D. Wheeler	20.66	″ 148 ″	3rd Sept., 1890
Poorman	Nelson	C. Hussey *et al*	20.66	″ 101 ″	7th Feb., 1891
Payne	Slocan	S. S. Bailey *et al*	12.56	″ 499 ″	17th Mch., 1893
Paradise	Nelson	John Miles	20.66	″ 728 ″	29th Aug., 1895
President	Goat River	John H. Field *et al*	17.17	″ 782 ″	11th Feb., 1896
Poorman	Trail Creek	P. Clark *et al*	2.37	″ 925 ″	21st July, ″
Paris Belle	″	Paris Belle Mining Co	31.28	″ 531 ″	Not issued.
Perhaps	Ainsworth	A. W. McCune	17.38	″ 971 ″	28th Feb., ″
Phœnix	Trail Creek	Phœnix G. M. Co	25.17	″ 953 ″	16th Mch., ″
Pacific	Nelson	Ed. Mahon	15.06	″ 903 ″	19th Aug., ″
Pittsburg	Trail Creek	J. R. and A. Stussi	47.90	″ 1150 ″	Not issued.
Palo Alto	″	Palo Alto G. M. Co	51.44	″ 950 ″	21st Sept., ″
Pott	″	Caledonia Con. M. Co	10.15	″ 733 ″	14th Oct., ″
Pauper's Dream	Ainsworth	Arabella Coy	51.65	″ 1163 ″	15th Oct., ″
Queen Bess		Wm. Glynn *et al*	37.72	″ 215 ″	22nd Sept., 1893
Queen Victoria	Nelson	J. J. Baker *et al*	20.66	″ 368 ″	27th May, 1896
Royal Charter	″	A. H. Kelly.	18.20	″ 232 ″	16th Nov., 1891
Round Hill	Illecillewaet.	A. E. McCallum	20.66	″ 201 ″	5th Sept., 1892
Rand	Ainsworth	D. F. Strobeck	51.65	″ 675 ″	13th Feb., 1895
Ruby Silver	Slocan	W. P. Russell	17.34	″ 515 ″	22nd ″ ″
Rockingham	Trail Creek	D. J. Burke *et al*	10.13	″ 731 ″	21st July, 1896
R. E. Lee	Slocan	G. and L. Alexander	18.85	″ 579 ″	10th Sept., ″
Red Mountain	Trail Creek	Chas. Sweeny	39.13	″ 1030 ″	28th ″ ″
Ruecan	Slocan	J. M. Harris *et al*	29.04	″ 624 ″	21st Oct., ″
Silver King	Ainsworth	W. A. Hendryx	20.00	″ 49 ″	15th Feb., 1888
Silver King	Nelson	Chas. Hall *et al*	19.3	″ 141 ″	1st Dec., 1890
Skyline	Ainsworth	A. D. Wheeler	19.50	″ 137 ″	3rd Sept., ″
Sweden	″	E. W. Herrick	16.95	″ 145 ″	11th Nov., ″
Spokane	″	Pacific Bullion M. Co	13.15	″ 212 ″	21st July, 1893
Silver Queen	Nelson	R. A. and A. C. Fry	20.25	″ 105A ″	29th Jan., 1891
Sunrise	″	Ed. Dempsie	8.20	″ 238 ″	15th Dec., ″
Slocan Star	Slocan	Byron M. White	20.6	″ 545 ″	27th May, 1893
Slocan Boy	″	E. J. Hale *et al*	20.66	″ 626 ″	5th Sept., ″
Storm Cloud	Ainsworth	Geo. C. Howe	17.96	″ 300 ″	4th Nov., ″
Shafer	″	Shafer G. & S. M. Co	30.00	″ 556 ″	21st ″ ″
St. John	Slocan	A. Behne *et al*	50.24	″ 472 ″	11th April, 1894
Starlight	Nelson	A. H. Kelly *et al*	20.66	″ 684 ″	5th Mch., 1895
Shunieau	Slocan	M. Grady *et al*	51.30	″ 718 ″	12th Feb., ″
Standard	″	″	51.65	″ 564 ″	11th ″ ″
Surprise	″	″	15.66	″ 563 ″	11th ″ ″
Stranger	Ainsworth	J. A. Whittier *et al*	31.55	″ 512 ″	15th ″ ″
Surprise No. 2	Slocan	Slocan Surprise M. Co	31.18	″ 514 ″	22nd May, ″
Silver Cup	″	Chas. Holten	20.66	″ 768 ″	26th July, ″
Selkirk	Goat River	J. H. Field *et al*	50.65	″ 784 ″	11th Feb., 1896
Southern Cross	Trail Creek	Thos. Smirl *et al*	40.43	″ 964 ″	16th Mch., ″
Sunset	Ainsworth	R. E. Lemon *et al*	43.43	″ 970 ″	10 Feb., ″
Slater	Slocan	Walter C. Adams	1.52	″ 752 ″	18th Mch., ″
St. Louis	Trail Creek	Jos. Brown *et al*	51.65	″ 935 ″	30th April, ″
St. Elmo	″	F. C. Loring	20.66	″ 923 ″	27th May, ″
Spotted Tail	″	Chas. Schmidt *et al*	37.5	″ 988 ″	21st ″ ″
Silver Star	″	H. Bostock	46.56	″ 939 ″	28th July, ″
Snap	Slocan	Jno. Elliott *et al*	32.09	″ 911 ″	25th ″ ″

West Kootenay.—*Concluded.*

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
San Francisco	Trail Creek	Martin Salmon *et al*	39.77	Lot 1056, G. 1	25th Sept., 1896
Silverine	″	Silverine G. M. Co	42.66	″ 732 ″	14th Oct., ″
St. Paul	″	W. A. Campbell	39.58	″ 1208 ″	15th ″
San Joaquin	″	San Joaquin G. M. Co	51.06	″ 1174 ″	3rd Dec., ″
Sunset	Ainsworth	Jno. L. Retallack	51.65	″ 1161 ″	8th ″ ″
Tough Nut	Nelson	Fitch *et al*	11.86	″ 186 ″	5th ″ 1891
Tenderfoot	Ainsworth	W. W. Sprague	19.64	″ 179 ″	2nd June, ″
The Dandy	Nelson	Fox, Kelly *et al*	19.00	″ 231 ″	12th Sept., ″
Tam O'Shanter	Ainsworth	Montreal-Kootenay M. Co.	16.52	″ 401 ″	24th Jan., 1893
Try Me	Nelson	Harold Selous	00.75	″ 115 ″	10th April, ″
Tiger	Ainsworth	J. M. Squire	20.66	″ 88 ″	20th Mch., ″
Two Jacks	Nelson	S. S. Bailey	8.69	″ 497 ″	17th ″ ″
Trinket	Ainsworth	Pacific Bullion M. Co	19.26	″ 213 ″	15th Sept., ″
Twin Lakes	Slocan	Alamo Min. Co	36.23	″ 747 ″	27th Feb., 1896
Tiger	Trail Creek	A. B. Campbell *et al*	26.30	″ 926 ″	21st May, ″
True Fissure	Trout Lake	Thos. Downs	47.52	″ 1097 ″	21st July, ″
Thompson	Trail Creek	Ross Thompson	5.45	″ 948 ″	25th Sept., ″
Trilby No. 2	″	Beaver G. M. Co	49.48	″ 1207 ″	″ ″
Texas	Slocan	J. M. Harris *et al*	51.65	″ 589 ″	22nd Oct., ″
Tornado	Trail Creek	B. C. Syndicate *et al*	29.24	″ 1156 ″	4th, Dec., ″
United	Ainsworth	Revelstoke M. Co	20.00	″ 172 ″	13th Feb., 1891
Union	″	Fitch *et al*	11.86	″ 186 ″	5th Dec., ″
Uncle Sam	Trail Creek	A. B. Campbell *et al*	33.64	″ 983 ″	21st May, 1896
Union	″	H. McGlynn *et al*	51.65	″ 944 ″	24th Aug., ″
Victoria	Nelson	Hall Bros. *et al*	18.54	″ 248 ″	29th Nov., 1894
Virginia	Trail Creek	Jos. Bourgeois *et al*	18.80	″ 681 ″	5th April, 1895
View	″	Jno. A. Finch	11.55	″ 645 ″	30th ″ 1896
Victor	″	W. J. C. Wakefield	46.54	″ 1062 ″	9th Dec., ″
Washington	Slocan	Wm. Lynch *et al*	14.76	″ 541 ″	26th May, 1893
Wanacott	″	S. S. Bailey *et al*	44.21	″ 404 ″	23rd Mch, ″
Whitewater	Nelson	W. G. Goepel	20.66	″ 529 ″	25th Feb., ″
Wonderful	Slocan	N. E. Lay *et al*	24.50	″ 481 ″	23rd Sept., ″
Wellington	″	Koot. & Col. Pros. M. Co.	50.5	″ 553 ″	11th April, 1894
Wakefield	Ainsworth	Canadian Pacific M. Co	43.	″ 712 ″	30th Aug., ″
Western	Slocan	H. Mann *et al*	51.65	″ 565 ″	25th Jan., 1895
War Eagle	Trail Creek	J. Bourgeois *et al*	18.58	″ 680 ″	5th April, ″
White Bear	″	J. J. Cole	30.83	″ 1149 ″	25th Sept., 1896
Yankee Girl	Nelson	H. Selous.	19.41	″ 406 ″	20th Mch., 1893
Young Dominion	Slocan	J. E. Boss.	49.50	″ 458 ″	17th Jan., 1894
You Know	Trail Creek	W. G. Benham	7.88	″ 982 ″	18th Mch., 1896
Yorkee Joke	Nelson	E Mahon	18.57	″ 905 ″	19th Aug., ″
Zilor	Slocan	Ed. and H. Mahon	18.46	″ 741 ″	23rd Sept., 1895
Zilor	Trail Creek	W. Perdue *et al*	12.77	″ 1051 ″	21st July, 1896
Sunlight	Ainsworth	H. Miller *et al*	20.66	″ 715 ″	13th Feb., 1895

Lillooet.

Brown Extension	Lillooet	Foster Gold M. & M. Co.	20.60	″ 103 ″	10th Nov., 1887
Bell Location	″	E. Bell	20.66	″ 127 ″	28th Sept., 1889
Drake ″	″	M. W. T. Drake	20.66	″ 128 ″	28th ″ ″
Foster ″	″	F. W. Foster	20.60	″ 101 ″	10th Nov., ″
Henderson	″	Geo. Henderson	20.60	″ 102 ″	10th ″ 1887
Iron Clad	″	J. O'Brien	20.66	″ 289 ″	28th ″ 1895
Lone Prospector	″	Jno. O'Brien	20.66	″ 288 ″	28th ″ ″
McB. Smith	″	Jas. McB. Smith	20.66	″ 123 ″	5th Dec., 1888
Ward Location	″	P. H. Ward	20.50	″ 125 ″	9th Feb., 1889
Hiram ″	″	Hiram Gould	20.60	″ 124 ″	9th ″ ″
Harvey ″	″	H. W. Harvey	20.66	″ 126 ″	28th Sept., ″

NEW WESTMINSTER.

Name of Claim.	District.	Name of Grantee.	Acres.	Description.	Date of Grant.
Elsie	New West'r.	Geo. deWolf	51.65	Lot 1648, G. 1	1st Mch., 1895
Kemptville	〃	H. Abbott *et al*	20.66	〃 1608 〃	10th April, 1893
〃 Extension	〃	G. Bower *et al*	20.66	〃 1609 〃	〃 〃
〃 No. 2	〃	Thos. Tompkins	20.66	〃 1607 〃	〃 〃

SAYWARD AND COAST.

Bobby Burns	Victoria	Channe M. Co	45.40	Lot 201*a*	2nd Dec., 1896
Daniel Webster	〃	〃	28.70	〃 203*a*	3rd 〃 〃
Hetty Green	〃	〃	35.33	〃 202*a*	2nd 〃 〃
Moss & McKay	〃	McKay & M. Moss		Sec. 9, Blk. 1	20th Oct., 1882
Poodle Dog	〃	Channe M. Co	51.65	Lot 204*a*, R. 1	2nd Dec., 1896

YALE.

Amelia	Osoyoos	Jas. Monaghan	15.50	Lot 273, G. 1	14th May, 1889
Alice	〃		17.50	〃 271 〃	12th June, 〃
Azela	Kamloops	Wm. Palmer	20.66	〃 692 〃	27th Sept., 〃
Argen	Osoyoos	J. A Mara	20.66	〃 343 〃	2nd June, 1891
American Boy	Kettle River.	R. L. Rutter	51.65	〃 619 〃	4th Sept., 1895
Anarchist	Osoyoos	R. G. Sidley	51.65	〃 647 〃	23rd April, 1896
B. C. Copper M. Co	Similkameen	B. C. Copper M. Co	41.00	〃 59,60 〃	16th Mch., 1887
Belle Scott	Kamloops	Nicola M. & M. Co	20.40	〃 590 〃	〃 〃
Batouche	Vernon	Hidden Treasure M. Co	20.66	〃 256 〃	28th Jan, 1889
Big Sandy	Kamloops	D. J. Buchanan	20.66	〃 637 〃	23rd July, 1888
Brown Bear	Osoyoos	Wilkinson *et al*	20.60	〃 385 〃	17th June, 1892
Bonanza Queen	Similkameen	Thos. Rabbitt *et al*	20.66	〃 72 〃	5th Sept., 1893
Black Diamond	Osoyoos	S. Mangott *et al*	20.58	〃 578 〃	22nd May, 1894
Cole, Geo. W	Yale	Geo. W. Cole	22.70	〃 26 〃	25th Oct., 1878
Christina	Kamloops	Nicola M. & M. Co	20.66	〃 587 〃	16th Mch., 1887
Cariboo	Osoyoos	J. Monaghan	18.75	〃 272 〃	14th May, 1889
Copper Queen	Kettle River.	E. J. Roberts	19.25	〃 387 〃	1st June, 1892
Copper Mine	Vernon	Jno. Moran	20.00	〃 456 〃	7th April, 1894
Cornicopia	Kettle River.	Jno. Douglas	41.25	〃 608 〃	23th Jan., 1895
City of Paris	〃	Jno. Stevens *et al*	18.24	〃 622 〃	4th Nov., 〃
Comet	Osoyoos	Jno. Stevens	15.50	〃 624 〃	18th Jan., 1896
Cordick	Kettle River.	R. C. Adams *et al*	51.65	〃 625 〃	13th Mch., 〃
Dark Horse	〃	R. Wood	35.15	〃 597 〃	18th Jan., 〃
Eureka G. M. Co	Yale	Eureka G. M. Co	19.20	〃 24,25 〃	7th July, 1875
Eureka	Kettle River.	Jno. Douglas	19.90	〃 242 〃	12th April, 1888
Emma	Osoyoos		20.66	〃 270 〃	12th June, 1889
Eagle	Kettle River.	F. Richter *et al*	20.64	〃 577 〃	30th May, 1894
Empire	Osoyoos	F. R. Kline	51.65	〃 611 〃	21st 〃 1895
Enterprise	Kettle River.	J. E. Boss *et al*	15.75	〃 617 〃	4th Sept., 〃
Emma	〃	Wm. T. Smith	48.49	〃 591 〃	25th 〃 1896
Gentle Annie	Kamloops	Nicola M. Co	20.66	〃 589 〃	16th Mch., 1887
Gold Cup	〃	Jno. Hepburn	20.28	〃 675 〃	15th Oct., 1888
Golden Crown	Kettle River.	W. J. Porter	51.65	〃 600 〃	29th July, 1896
Great Hopes	〃	Jno. P. Harlan	43.30	〃 602 〃	28th Sept., 〃
Joshua	Kamloops	Nicola M. Co	16.90	〃 588 〃	16th Mch., 1887
Jenny Long	〃	Thos. J. Jones	20.66	〃 718 〃	16th Jan., 1890
Joe Dandy	Osoyoos	E. Hammond	20.60	〃 447 〃	6th Sept., 1893
King William	Kamloops	Nicola M. Co	20.50	〃 592 〃	16th Mch., 1887
Kamloops	Osoyoos	Jno. Moran	17.27	〃 275 〃	9th May, 1890
King Solomon	Kettle River.	E. J. Roberts	20.60	〃 388 〃	1st June, 1892
Knob Hill	〃	C. J. Lundy *et al*	19.09	〃 590 〃	24th Feb., 1896
Lake View	Osoyoos	Jno. Stevens	20.66	〃 575 〃	4th April, 1894
Last Chance	〃	H. White *et al*	20.66	〃 584 〃	10th Sept., 〃
Lincoln	Kettle River.	Jno. Stevens *et al*	18.13	〃 621 〃	4th Nov., 1895
Murphy, C. & J.	Yale	Murphy, C., *et al*	1.80	〃 27 〃	3rd Dec., 1878
Mary Reynolds	Kamloops	Jno. Hepburn	20.66	〃 674 〃	15th Oct., 1888

YALE DISTRICT.

KAMLOOPS AND YALE DIVISIONS.

By G. C. Tunstall, Gold Commissioner.

I have the honour to submit the annual mining report for the Kamloops and Yale Divisions of Yale District, to which is attached a statement of the particulars connected with the Harrison Lake mines, kindly forwarded by Mr. J. R. Brown, of the Harrison Hot Springs, to whom, and also to Messrs. S. McCartney, of Savona; W. Dodd, Mining Recorder at Yale, and H. Cancellor, of North Bend, I am deeply indebted for information supplied on this and former occasions.

KAMLOOPS DIVISION.

Placer Mines.

Tranquille River.

I regret to say but little placer mining was prosecuted the past summer on Tranquille River, which is the principal producer of alluvial gold in this division.

A few Chinese and white men find employment, with small returns for their labour. These placers have been steadily worked for a period of thirty-six years, and it is surprising they should still be able to attract the few miners who work on this stream.

Gilbert Smith, who has a leasehold at the junction of the North and South Forks, has finished the construction of his ditch, but was unable to work any ground, owing to the dry season, which caused a scarcity of water.

The Thompson River Hydraulic Mining Co. obtained a leave of absence from their property last summer. I understand it is their intention to resume piping next season.

Some seven or eight Chinese, who have resided on this creek for a number of years, manage to make a comfortable living by combining mining with gardening.

J. Russell, whose claim paid $3 per day to the hand, has had it included in a mining leasehold of eighty-one acres, which will be worked by the hydraulic process, the increase in the height of the bench of gravel rendering ground-sluicing no longer profitable.

Scotch Creek.

About ten or twelve Chinese worked on this Creek the past summer, with what result I have been unable to learn.

Thompson River.

Messrs. Bellamy, Macdonald and Jones have two leases of mining ground at the Horseshoe Bend. A grant of water has been obtained for hydraulic mining, with the intention of actively prosecuting work in the spring.

Salmon River.

Messrs. James and Ross Mahon have two mining leaseholds on this river, which have, so far as known, yielded no profitable returns.

The yield of gold for the past year is estimated at $3,500, of which amount the Bank of British Columbia purchased $3,100.

The mining receipts are as follows:—

Free Mining Certificates....	$1,467 00
General Mining Receipts	1,898 25
	$3,365 25

The above figures exceed the revenue from the same source for 1895 by $2,169.10.

MINERAL CLAIMS.

Coal Hill Mines.

Coal Hill derives its name from a deposit of excellent coal found a few years since, about three miles south of the town. A tunnel was run a considerable distance, but the broken up condition of the seam and an insufficient thickness led to its abandonment.

This was the first discovery of mineral of any kind made on the mountain, which is probably destined to become one of the principal mining camps in the Province.

It is situated in the midst of a pastoral country which, since the advent of the first white settlers, was only deemed valuable for pasturing cattle. Starting from Kamloops a constant succession of grassy, rolling hills, dotted with pine trees, ascend to an elevation of 3,300 feet above the level of the sea. From every point of view the scenery is of the most pleasing and picturesque character, which never fails to attract the admiration of the beholder.

The mountains of the Gold Range are here clothed about two-thirds of their height with bunch-grass, the support of numerous herds of cattle. Above that the timber line intervenes, embracing within its limits an abundant growth of pine and fir, principally the latter.

The country is everywhere accessible to persons riding on horseback, and an excellent waggon road already exists, to which an extension of about a mile will intersect some of the principal claims, and afford all the facilities that will be required for transportation.

The Veins.

The general trend of the veins is east and west. They lie in a diorite formation, and exist under similar conditions to those found in the Rossland District, accompanied by the characteristic iron capping, which is a prominent feature of those deposits. The ore is also of the same character, being chalcopyrite, assaying from five to thirty per cent. in copper, and from $4 to $8 in gold. The vein matter is diorite. The lodes average in width from 4 to 20 feet, and the locations now extend over an area of about 20 square miles. Fuel is abundant, and an unrivalled climate, in addition to short railway communication, completes the advantages which very few mining camps possess. Two hundred claims have been recorded to date.

The first discovery was made in June by Louis Bennett, who brought some of the ore to Kamloops, and described in a vague manner the situation of the vein from which it was taken. Unaware of its value he left shortly for the mica mines at the headwaters of the Thompson River, without taking any steps to locate. This led to a search on the mountain, which resulted in the mineral claim known as the Python being staked and recorded. The richness of the deposits soon spread, and within two or three weeks numerous prospectors were roaming in every direction in quest of mineral wealth.

Messrs. Cobbledick and W. T. Newman, two gentlemen possessed of great mining experience, who are acting for capitalists in England and the Dominion, have inspired general confidence by becoming interested in some of the most important mines. The latter is the author of "Hidden Mines, and How to Find Them," a work which has attained an extensive sale, and is considered indispensable to every miner and prospector. The following is a summary of the particulars connected with some of the most important locations, on which more or less work has been accomplished:—

The Python.

A vein can be traced on the surface a considerable distance, exhibiting in some places a width of from 20 to 30 feet, with an average width of 8 to 9 feet. A shaft 60 feet deep has been sunk, from which about 30 tons on the dump will average from 15 to 18 per cent. copper, and $5 in gold to the ton. Four men are employed.

The Guerin, or Lucky Strike.

The Guerin Fractional claim, adjoining the Sunrise on the north, has a hole about 8 feet deep, showing a mass of ore 5 feet wide, which assays 22 per cent. in copper. This claim has been bonded to Mr. Cobbledick for $13,000.

The Chieftain.

This claim is situated near Sugar Loaf Mountain. The ore is of the same character as that found in the claims previously mentioned, and averages from 5 to 15 per cent. copper, and from $1 to $5 to the ton in gold. A shaft is down 30 feet, in ore the whole distance. The vein varies from 4 to 10 feet in width. Work will be prosecuted during the winter.

The Iron Mask.

The Iron Mask is situated about four miles south west of Kamloops. Two cross cut have been run across the lode for distances of 20 and 30 feet, respectively, without encountering the hanging wall. The foot wall is a trap dyke. The direction of the vein is north and south. The average value of the ore is $60 in gold and copper. From 18 inches to 4 feet adjoining the hanging wall is clean ore. A full force of men will be employed during the winter.

The Canada.

This claim belongs to the King Mining Co. It is situated on Jocko Creek, about 7 miles south west of Kamloops. A shaft, 27 feet, has been sunk, showing a vein 6 feet wide. The company has bonded the mine for $4,000 until the 1st July, with a cash payment of $400.

Thora II.

The Thora II. adjoins the Python on the south. The croppings on the surface assay $8 in gold and 8 per cent. copper. The lode can be traced on the surface 500 feet, it averages 30 feet in width. A shaft has been sunk to a depth of 15 feet in low grade ore, containing pockets and stringers of a high grade character. Messrs. Hoare and Keiper are the principal owners. The former is connected with the Everett Smelter, Everett, Washington.

Sunrise No. 2.

Is about two miles west of Kamloops, at the foot of the mountain, and about 200 yards from the railway track. Two veins of mineral intersect this property—one of asbestos, from 8 to 12 inches wide, of first-class quality, exhibiting a tough fibre capable of being manufactured into textile fabrics. The other lode is composed of diorite, assaying from $8 to $12 in copper to the ton.

NORTH THOMPSON RIVER.—GYPSUM.

About 20 miles north of Kamloops, on the east bank of the Thompson, a large deposit of gypsum of excellent quality can be distinctly traced for a couple of miles up the mountain side. It is within a mile of the river, and will therefore admit of cheap transportation to the Canadian Pacific Railway, which is an important factor, to allow of profitable returns.

GLEN IRON MINING CO., CHERRY CREEK.

This company is engaged completing a contract to supply the Tacoma smelter with 500 tons of ore.

ADAMS LAKE GROUP.

After a series of exhaustive tests made by the owners of this group of mines, some six or seven in number, with the object of determining the value of the ores, and ascertaining the most economical and efficient process for working them, no doubt exists as to the profits that will accrue from their treatment. A company has been incorporated, with a capital of $400,000, for the active prosecution of development next spring. Fifty thousand dollars is to be expended in the construction of a cyanide plant with a capacity of treating from 50 to 60 tons per day. These mines exhibit immense bodies of ore, and their wealth will add to the material prosperity of the district.

STUMP LAKE MINES.

Many of the vacant locations which had been recorded ten or eleven years ago have been relocated, with additional new ones. It is stated that work will be commenced on some of the mines on which large amounts were expended in former years.

ROCKFORD GROUP.

An important mining discovery was made last fall at Rockford, in the Nicola Valley, a short distance east of the waggon road. The find consists of three quartz veins, running parallel to each other, which possess a width of 17, 5, and 3 feet, respectively. The assays from surface croppings show returns of $10.50 in gold and 7½ ounces of silver to the ton. These locations are situated about two miles south of the Stump Lake silver mines. The results obtained are very encouraging, and undoubtedly prove these deposits to be richer than any yet found in that section of the country. The rock is free milling, and that feature will greatly add to its value.

GRAND PRAIRIE GROUP.

About twelve claims have been taken up at Grand Prairie, at the rear of the settlement. The F. C. Jones Mining Co. have four locations, named the Alice Hay, Henrietta, Forest Queen and Key. The vein is from 1½ to 2½ feet wide in the Henrietta, and extends through the other claims, on which more or less work has been accomplished. A shaft, 30 feet deep, has been sunk on the Henrietta. The assays range from $15 to $20 in silver, gold and copper. The proportionate value of each metal I have not been able to learn.

COPPER CREEK CINNABAR MINES.

The Cinnabar Mining Co. have prosecuted development with diligent activity under adverse conditions with a force of twenty men. In the early part of last summer the work was confined to the Yellow Jacket, in which about 550 feet of tunnelling has been completed and 200 feet of upraises. Prospecting with the diamond drill was also carried on, and the results have proved very satisfactory to the company. By this means large bodies of low grade ore have been discovered which can be worked to profitable advantage. The superintendent, Mr. Veatch, has now turned his attention in the Rose Bush claim to what is known as the Big Dyke, the tunnel being in some distance in good furnace ore. Should the present prospects continue this supply alone will provide for present requirements. There is every indication the deposit is permanent and will increase in size with depth.

Cinnabar mining in this section of the country is destined to become an important and profitable industry, and the company deserve credit for the perseverance they have exhibited under great difficulties.

A furnace, with a capacity of 25 tons, is ready for erection, and will be in operation before the spring. The facilities for delivering the ore from the mine are completed.

HARDIE MOUNTAIN CINNABAR MINES.

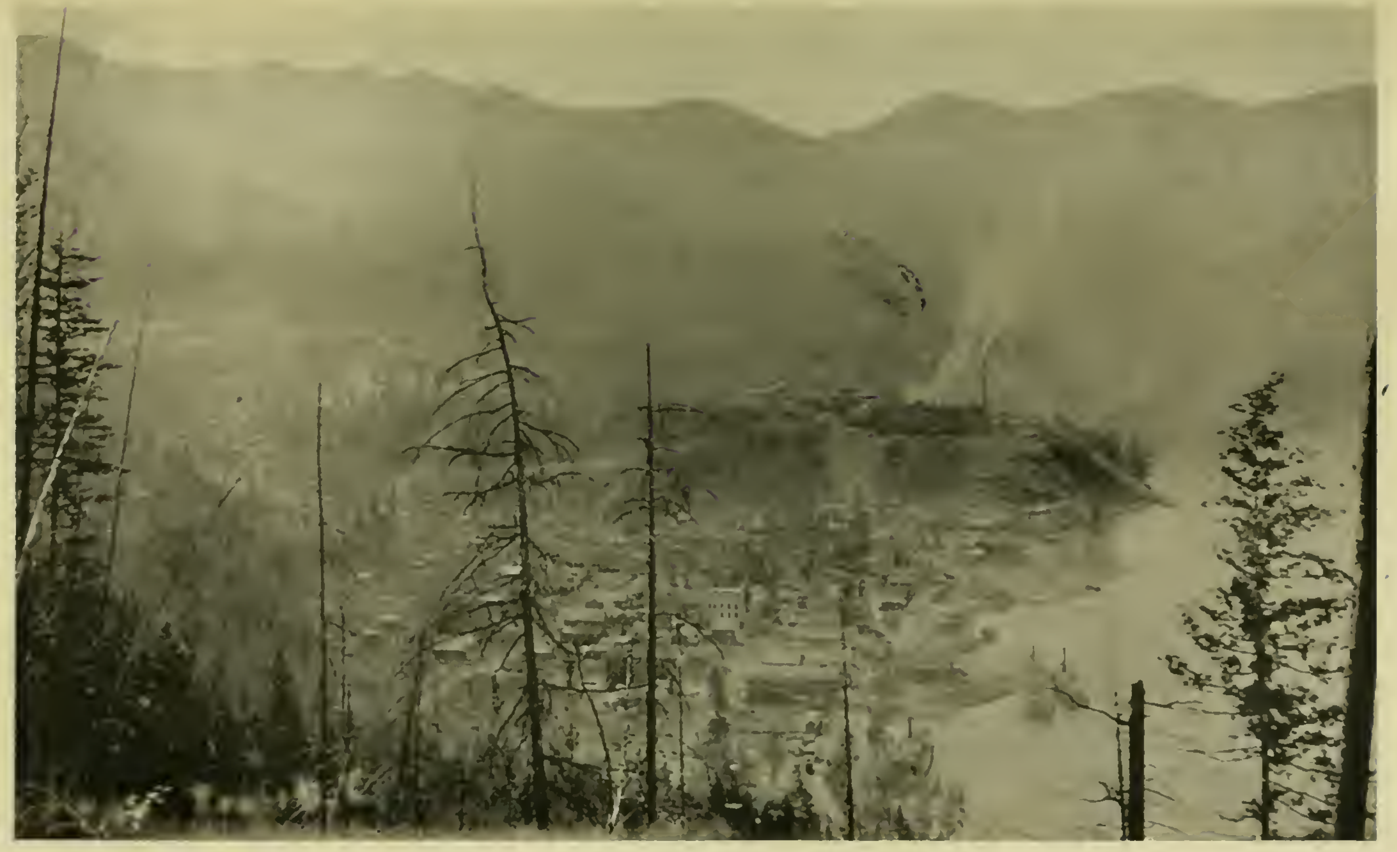
The cinnabar locations at Hardie Mountain exist in a similar formation to that which prevails at the mines previously mentioned, and are situated about three miles distant in a northerly direction. The work performed has been of a superficial character, owing to a lack of means and difficulties imposed by surface water. Mr. Irving is pushing a tunnel in the Columbia, one of the group of claims taken up in this vicinity. It has reached a distance of 135 feet. The prospects are improving every day, and the ore shows up better as the work proceeds. This tunnel will prospect the deep ground, and also assist the drainage. Assessment work on the other claims show good bodies of ore, averaging from 1 to 2½ per cent. These properties are attracting attention, and it is probable a good company will be formed to proceed with development in the spring.

DEADMAN'S CREEK CINNABAR MINES.

Deadman's Creek lies about eight miles east of Copper Creek. The same deposit of cinnabar shows up again on this creek. A number of claims, which yielded favourable assays, have been recorded. The Cariboo, Lillooet and Fraser River Gold Fields Co. own most of the locations which are favourably situated, being within a comparatively short distance of the C. P. Railway and easy of access.

CHRIS CREEK CINNABAR MINES.

Chris Creek is a tributary of Deadman's Creek. Several locations were made on this creek last summer. Very little work has, however, been effected. The ore is precisely the same as that at Hardie Mountain, and is evidently a continuation of the lead at Copper Creek. The assay value is from 1 to 2½ per cent.



THE TOWN OF TRAIL, B. C.

(See page 18, Bulletin No. 2.)

Showing Smelting Works, Columbia River, Steamboats, Etc.

Copper Creek Copper Mines.

Very little outside of assessment work has been done last season on this group of copper claims near Kamloops Lake. Development work has been delayed pending the result of arrangements with a view of their being bonded, the present owners not being in a position to undergo the expense involved in prosecuting the necessary mining improvements. The latest reports state that the deal is about completed, and work will be in active progress next summer.

YALE MINING DIVISION.

Placer Claims.

Hill's Bar.

The Columbia Co., owing to scarcity of water, did little more than prospecting the past summer, the yield of gold being $800. The ground is reported rich. It is the intention to utilise a larger and more permanent supply of water to permit of more extensive operations.

Siwash Creek.

This creek is a tributary of the Fraser, and empties into that river 4½ miles above Yale. It is situated on the left bank, and is reached by means of a cable. A good trail leads to the mines. A large amount of gold was taken from this stream in early days, where sufficiently favourable conditions existed for its extraction. The heavy flow of water encountered in sinking has prevented the deep ground from being bottomed, notwithstanding many attempts to overcome this obstacle. However, a few miners still persist in attempts to reach the bed rock. Most of the mining leaseholds have had little or no work done on them for the same reason as above stated—too large a quantity of water to handle.

Five Mile Creek.

A large camp of Chinese miners are working here, obtaining moderate wages.

Eight Mile Creek.

Messrs. Hogar and Gardner have undergone considerable expense in bringing water on their property, which is an hydraulic mining leasehold of about 10 acres. The summer's work has proved to be unprofitable; but little gold was obtained, although a large amount of gravel was washed.

Spuzzum.

Indians and Chinese, also a few whites, were rocking in this vicinity.

Boston Bar.—Ottawa Mining & Milling Co.

This company was prepared to wash about the end of June last but in consequence of the exceptionally dry season, and accidents to the flume by land slides, the monitor was kept at work for only about three weeks. The washes-up amounted to $1,830, which is a very good return, considering the disadvantages encountered. The company is fully satisfied with the richness of its ground.

Wendell Co.

This company's property is close to 4-Mile Creek, whence the necessary supply of water is obtained. They were engaged in ground-sluicing for a short time, but had to shut down owing to shortness of water.

North Bend.

Two mining leaseholds have been granted in the vicinity of North Bend, one opposite Salmon River, the other near Keefer's. The gravel in the last mentioned is reported as being rich. The gold found is coarse.

Mining has been carried on to a limited extent between North Bend and Lytton

Keefer's, Cisco, Kanaka Bar and Lytton are localities mined principally by Indians with rockers.

Lytton.

Mr. T. Earl has secured a lease of ground formerly in the possession of the Van Winkle Hydraulic Mining Co.

Sual Claim.

This property, situated opposite Lytton, has been leased by Mr. Feason, who is experimenting with the Newman Gold Saving machine, a device for saving the fine particles of gold which are usually carried through the sluice boxes and lost.

RIVER DREDGING.

Dredging on the Fraser River has so far been attended with no favourable results. The large dredge belonging to the B. C. Gold Mining & Dredging Co. lay idle last summer at Ruby Creek, and the one at Lytton, owned by the Fraser River Mining & Dredging Co., worked above that point for a few days and then suspended operations.

The Beatty Co. are constructing at Boston Bar a scoop dredge, provided with powerful machinery. This is a kind of dredge much used for harbour excavations. The shovel, which is under perfect control of the machinery, can be swung around and submerged anywhere within a certain radius, and is capable of bringing up at each hoist ten tons of gravel. This is deposited in sluice boxes and washed. The large boulders are to be hoisted on scows and dumped at a distance down stream. By this means the scoop will be able to perform its work in a much more efficient manner. This scheme seems to possess more features capable of attaining success than any of the others, where the strong current can be avoided.

After a two years' test of the dredges at present in use for obtaining gold from the bottom of the Fraser River, provided with centrifugal pumps (which are utter failures) and buckets, and equipped with the best machinery and appliances that experience and ingenuity could suggest, the only reasonable conclusion that can be arrived at is, they are unable to surmount the obstacles presented by a powerful current and an accumulation of large boulders.

I may remark these disadvantages do not exist in the Clutha River, New Zealand, the only stream known where this branch of mining has yielded profitable returns, which have encouraged similar enterprises in this Province and elsewhere.

The following is the yield of gold the past year for the Yale Division of Yale District, which is perfectly reliable, being the respective amounts purchased by the merchants at the different points mentioned:—

Agassiz	$ 500	
Hope	112	
Yale	13,350	
Spuzzum	3,042	
North Bend	2,912	
Keefer's	3,200	
Lytton	14,939	
Spences Bridge	1,240	
Ashcroft	14,391	
Shipped direct to Victoria by Ottawa Hydraulic and Wendell and Columbia Companies	2,922	
Taken away in private hands and unaccounted for	5,000	
		$61,608
Free Miner's Certificates issued	$ 971 00	
General Mining, Receipts	3,032 15	
		4,003 15

Mineral Claims.

Hope.

At Hope considerable attention has been paid to prospecting for mineral claims, with the result that a number of claims have been staked off and recorded.

Yale Creek Group.

The favourable reports of mining experts on these mines, have resulted in the forming of a company for their further development.

A large amount of work was performed on these mines in former years. The necessary steps have been taken to obtain Crown grants in favour of the Gold Queen and other adjoining claims, preparatory to making arrangements for working them.

THE CINNABAR MINING CO., LTD., OF BRITISH COLUMBIA.

By J. A. Veatch, Superintendent, Savonas.

Mercury.

The Cinnabar Mines is situated on the north side of Kamloops Lake, about six miles from the west end, in Kamloops Division, Yale District.

The present company acquired the *Rose Bud*, *Blue Bird*, *Hill Side*, *Lake View* and *Yellow Jacket* by purchase early in 1895, and since have located two adjoining claims.

Development work was commenced immediately after the property was acquired, and in August, 1895, two retorts were erected under the superintendence of Mr. H. L. Lightner. They were only operated a few weeks when the high grade ore of the Rose Bud was exhausted, that process not being suited for the reduction of the lower grade of ore, but in the short time they were operated more than 100 flasks of quicksilver were reduced and shipped from the mine. The present reduction works under construction are a granza (coarse ore) furnace of between 25 and 30 tons daily capacity, of modern pattern, and a system of transporting and handling the ore that will enable us to mine, transport and reduce it at a minimum cost.

The exploratory work consists, on the "Rose Bud" claim, of a tunnel 310 feet in length, cross-cuts aggregating 260 feet, an upraise to the surface, with drifts at different levels aggregating 150 feet, and a stope of considerable size, from which stope a large proportion of the ore reduced was extracted.

On other parts of this claim several small drifts and surface excavations have been made; the workings known as the Big Dyke and No. 8 tunnel are also on this claim, or at least in part, and here a tunnel has been run 120 feet, with two cross-cuts just commenced, an upraise to the surface 80 feet in height. Here there are also comparatively extensive surface excavations, and present operations are confined to this part of the mine. On the "Yellow Jacket" there have been run two tunnels, one 90 feet in length, the other 260 feet, with four cross-cuts, aggregating 330 feet in length; two connections with the surface, 80 and 100 feet respectively, the latter having two levels, with drifts amounting to 220 feet in length.

In the face of this tunnel and beneath the level of it more than 1,200 feet in all have been drilled with a Sullivan diamond drill, while there has also been a considerable amount of surface exploring done in the same vicinity, and on the remaining claims a small amount of surface work.

Geology.

The country rock is "picrite," a dark green highly acidic rock of Tertiary volcanic origin. It is rent by fissures of varying width, the smaller filled with a dolomite gangue and containing the high grade ore, the larger with a rock graduating from tufa to rhyolite, much of it containing disseminated minute crystals of cinnabar. This ore-bearing rock is highly ferrated on the surface, and usually completely serpentized beneath. The deposits are everywhere badly faulted and dynamically crushed, but to treat on this subject completely would require a volume alone.

HARRISON LAKE GROUP.

By John R. Brown.

Trout Lake Mines.

Discovered October, 1895. Formation of country rock, syenite and ferruginous slate, in the contact between which is a belt of highly silicious schist intermixed with quartz, both impregnated with iron and copper sulphurets, forming a mineral zone of considerable width, and carrying gold and silver values averaging on the Black Diamond claim, where it is shown up to advantage, about $4 per ton, a capital concentrating proposition being capable of reduction from 15 to 20 to 1, with probably greater values when more depth is reached. The general direction of this belt is north-west and south-east.

In the ferruginous slate the country rock lying to the north of the syenite are to be found belts of serpentine, metamorphic slates. Very large lodes of mineralized quartz, all having the same general direction, north-west and south-east, and extending for a great distance in this belted manner, occasionally, however, showing on the surface traces of disturbance in the shape of folds, breaks, etc., sometimes in waves. I do not think that there has been much glacial action at this point, and consequently more work is left for the miner.

Since the discovery of these prospects last year about sixty locations have been made, and of these about twenty have been secured by development, the rest being probably abandoned.

This is, however, no test of the value of the camp as a future mining centre, for while it may prove it to be no poor man's camp I feel confident that it will eventually turn out to be a very large producer of perhaps low grade ore, but with a fair margin of profit between cost of extraction and treatment and value of ore.

Development.

On the Discovery claim, located by Geo. Black, an open cut of about 20 feet in length and a tunnel of about 40 feet

This work cross-cuts the vein, or more properly speaking, a portion of it, as the breast of the tunnel is still in vein matter, rock very easy to work. The work, however, has been done in a bad place, no dump, while much better results in depth could have been gained at other points. The showing is very satisfactory, however, and from this point I obtained my samples for assay, etc.

This property has been to some extent assisted by natural forces in the shape of a waterfall, which has cut down the country rock overlying the vein. This water-fall, with a very large head, offers great advantages in the future working of the property.

The Empress group of claims, six in number, about one mile north-west of the Black Diamond. While this group is not quite so close to the syenite, it was known that a shaft of some depth would strike the vein of the Black Diamond, while the outcroppings in the overlying belts in the ferruginous slate or iron capping gave promise of the discovery of valuable ore shutes, similar from the character of the outcrop to the Rossland mines; hence the selection of these locations offering, as they do, a double advantage. A tunnel, which is now in about 100 feet, and a cross-cut about 20 feet long, starting near the breast of tunnel, is so far the amount of development work. The rock has from the start been very hard, and while encouraging, inasmuch that almost from the start bunches and stringers of mineral have been found, they have in most cases been of too low a grade for shipment. That ore shutes of considerable value and size will be found eventually, judging from the outcroppings, I think is very probable, while the success of the other properties lying above and below these, on the contact already described, will also justify the owners in holding these claims, as this contact can be reached, as before stated, by sinking. As to other development work in this camp, the owners of a consolidation of several claims, under the direction of Mr. Cecil Smith, have done several hundred dollars' worth of tunnelling and sinking, but the work was not sufficient to demonstrate anything. A few other claims have had assessment work done on them, but in many instances without regard to location, but simply to hold the claims.

As to other portions of your district in the neighbourhood of Harrison Lake, very favourable reports are coming in. At Silver Creek a large quartz vein has been discovered and located on for two miles. Vein, 17 feet wide in slate; surface assays $26 in gold to ton. A rich section extends from this point to Yale, about thirty miles distant, the country rock being diorites, serpentines and slate.

In prospecting over a large extent of country during the past summer and fall, embracing parts of both Yale and New Westminster Districts, I was astonished at the superficial evidences of great mineral wealth when crossing many of the different formations. Often it was no longer a question of seeking but of selection, a veritable "embarass de riches." The more I see of the coast country the more firmly am I convinced that not far in the future it will contain as many producing mines as all the combined producers of the interior.

SIMILKAMEEN DIVISION.

By Hugh Hunter, Mining Recorder.

I have the honour to forward my annual mining report for the Similkameen Division of Yale District for the year 1896:—

Hydraulic mining was not a success this season owing, in a large degree, to the inadequate supply of water.

The Granite Creek Mining Co. have completed the flume on their property, and had about a month's piping with a full head of water, but were unable to clean up on account of severe frost, which came unusually early for this section of the country.

Mr. W. J. Waterman piped on his claim at the mouth of Friday Creek for about three months, prospecting the ground, and had to cease work on account of too little water.

The Anglo-American Co., on the South Fork of the Similkameen River, had a large force of men at work for about three months, but shut down as the wash-up was not satisfactory.

The Tulameen Mining Company, whose property is about three miles below Granite Creek, had a force of five men prospecting. They worked about four months, when they were compelled to shut down for want of water.

Several placer claims have been worked out, and others were idle during the season, the owners having obtained leave of absence pending the sale of their property.

On the Tulameen River and its tributaries fifty-three mineral claims have been located. The ore is generally grey copper and galena. An assay of some ore taken from the Siberia Mineral Claim gives returns as follows:—

Lead, $7.80; silver, $55.64; gold, $2.07.

Several claims in this portion of the district have been sold, and others have been bonded. The Star Mining Co., of Terra Haute, Indiana, have acquired three locations at the headwaters of the Tulameen. A tunnel twelve feet long has been put in on the Sutter Mineral Claim, which shows a ledge of galena eighteen inches wide. This and other properties will be worked extensively next season. On the Similkameen and its tributaries thirty-one locations have been made. The ore is principally peacock copper, which assays about 60 per cent. copper, with a small proportion of silver and gold. As little work has been done on any of these, I am unable to report more fully as to their merits.

On the Iron Mountain, near the Coldwater, twenty-four mineral claims have been located. The mountain appears to be one huge deposit of mineral, and at one time it was located by a Vancouver company for its iron. A Victoria company took up three claims adjoining each other, namely, the Victoria, Charmer and Islander, and on sinking a shaft on the Charmer they found a valuable deposit of mineral, carrying gold, silver and copper. The shaft is now twenty-two feet deep, and shows a solid body of ore from top to bottom. At a depth of four feet an assay was made, which shows silver and copper to the value of $40.90, and a trace of gold. Work will be resumed on this property in the spring, as soon as the season opens.

Free Miner's Certificates issued	175
Mineral Claims recorded, 108; placer, 13	121
Transfers—Mineral Claims	22
Certificates of Work issued	11

THE OSOYOOS, KETTLE RIVER AND VERNON DIVISIONS.

By C. A. R. Lambly, Gold Commissioner, Osoyoos, B. C.

I have the honour to submit the annual mining report and statistics, for the Osoyoos Division of Yale District, for the year 1896:—

OSOYOOS MINING DIVISION.

Camp Fairview.

Work has been carried on in this camp during the latter part of the year with greater energy than at any time for the past two years, and a number of claims have been sold and bonded at prices ranging from $200 to $75,000. Of the old claims worked during the year the following are the only ones that have been worked to any extent, viz.: The "Morning Star," "Joe Dandy" Group, "Stemwinder" and "Smuggler."

The Morning Star.

In the north-east shaft, at a depth of 100 feet, a drift of 50 feet has been driven on one side of the shaft and the same on the other, and the shaft has also been continued 50 feet in depth. On the south-west shaft a drift of 20 feet has been run along the vein. Average milling test, $15 to $20 per ton.

The owners, Messrs. McEachern and Mangett, are at present engaged in sinking a shaft for the purpose of ventilating the mine.

The Joe Dandy Group.

This group consists of the "Joe Dandy," "Atlas," "Daisy," and "Belmont" claims. On the "Belmont" a tunnel of 20 feet has been run; on the "Daisy" a shaft of 30 feet has been sunk; on the "Joe Dandy" a new tunnel has been run for 60 feet to tap the ledge, and a winze sunk through to the old tunnel. This group is owned by the British Columbia Development Company. Mr. John R. Mitchell, general manager; Mr. Ballard, foreman.

Twenty-three men are at present at work, which force will be increased as room is made for more men to work in. There is about 100 tons of ore on the dump.

The Stemwinder.

On this claim an open surface cut of 12 feet has been run; altogether the development work on this claim consists of about 600 feet of tunnels and shafts. This claim is bonded to Messrs. Rhodes & Co., who, it is expected, will shortly take hold of it with a view of developing the property.

The Smuggler.

A drift of 20 feet has been run from the bottom of the 100-foot shaft along the vein, which is about five feet in width.

The following are claims which have recently been opened up, most of them being new locations:—

The *Comstock.*—A tunnel of 50 feet and a shaft of 100 feet has been sunk.

On the *Tin Horn* the work consists of two tunnels; the first of 65 feet, and the second of 50 feet.

On the *Randolph* a tunnel of 50 feet has been run, and a further contract of a 50-foot shaft has recently been commenced.

On the *Reco*, *Ocean Wave* and *Quartz Queen*, a 50-foot tunnel has been run on each.

Work is also being pushed forward on the following claims:—

California, *Ironclad*, *Fannie Morris*, *Nightingale*, *Sundown*, *Elmore*, *Shamrock*, *Highland Chief*, *Snow Bird*, *Winchester*, *Silver Bow*, *Mammoth*, *Gold Hill*, *Rob Roy*, *Grey Eagle* and *Iron Mask*. Messrs. Dier and Davidson, who have lately acquired these claims, have about 20 men steadily at work, and intend testing each of their claims.

The *Buckhorn*, owned by Messrs. Elliot and McDougall.—On this claim a shaft of average dimensions of 4 feet by 7 feet has been sunk for 38 feet, during the past year.

On the *Occidental*, owned by the same parties, a 17 foot shaft, 4 feet by 7 feet, has been sunk.

On the *Oro Fino* an open surface cut has been run for 10 feet and a shaft sunk 12 feet, by the owners, Messrs. Gwatkin and Winkler.

It is confidently expected that Camp Fairview will soon rank as one of the foremost mining camps in the District.

CAMP MCKINNEY.

On the *Cariboo* and *Amelia* the mill has been running continuously during the year, and has produced 8,743 ounces in gold, valued at $116,243, and 371,036 lbs. of concentrates, of a value of $14,980; total output of the mine for the year 1896 is $131,223.

The work consists of 510 feet of drift on the second and third levels, and 6,456 tons of ore stoped and milled. At present the work is being carried on at the third level, at a depth of 175 feet from the surface. About 30 men are constantly employed. I am informed that the owners intend shortly to increase the capacity of the mill to 15 stamps.

The Minnie-ha-ha.

This claim, which lies south and west of and nearly adjoining the "Cariboo," has one shaft sunk 45 feet, and a second of about 15 feet. The vein averages about 18 inches in width. The claim has recently been surveyed and a Crown grant applied for.

On the *Lemon* an open cut, 20 feet in length by 6 feet by 9 feet, was run on the east side of the main shaft. The cut penetrates the shaft at a depth of about 10 feet below the surface. The vein, which crosses the claim diagonally and has been traced on the surface for a distance of 1,700 feet, is a true fissure vein, running north-east and south-west, and is capped by iron to a depth of 10 feet. The east wall is quartzite and the west wall a black slate. Mr. Greevy, the owner, informs me that arrangements have been made for extensive development work during the coming season.

The Victoria Group.

This group consists of the *Victoria*, *Queen*, and *California* claims. Mr. Bash, who has charge of the development work for a Victoria company, has done a very considerable amount of surface work, having built a waggon road for about three-quarters of a mile to connect the claims with the Camp McKinney road, costing between $200 and $300; he has also erected a number of very substantial buildings on this property, and has had from 15 to 20 men continuously at work since the middle of September last. Two tunnels have been run on the Victoria, at a distance apart of about 700 feet, No. 1 in the centre of the claim and No. 2 at the extreme edge, close to the "Old England" claim. No. 1 has been driven 135 feet, and No. 2 97 feet; both tunnels are very securely timbered. It is expected to tap the ore body at a depth of about 125 feet on No. 1, and about 100 feet on No. 2. The ore lies in a talco-slate and diorite contact, running almost due north and south with the formation. Twenty-five assays have been made, giving an average of $65 to the ton.

Old England.

On this claim there are three veins running more or less parallel in a northerly and southerly direction the entire length of the claim. The dip of the veins is easterly. The main or centre vein is over 20 feet in width, and at a depth of 75 feet may be described as follows:—Commencing at the hanging wall is a gouge or salvage some 10 to 18 inches in thickness, composed of talc, impregnated with sulphides, adjoining which is a rich streak of ore some two or three feet in width, following which, towards the foot-wall, there are streaks of quartz and talc, intermixed, containing sulphides and galena, carrying gold. The shaft follows the hanging wall at a dip of about 45° for 50 feet; thence straightens to about 70°. The shaft is 6 feet by 8 feet 8 inches, securely timbered. A tunnel has been run a distance of 90 feet, with the object of tapping the vein at a depth of about 200 feet from the surface. The east vein is exposed by an outcrop of about 50 feet in length, and has been cross-cut 8 feet in ore carrying copper and iron sulphurets. This vein also crops out on the "Homestake," which is to the north of the "Old England." On the west vein a tunnel of about 30 feet has been run. The vein is 4 feet in width, and carries galena and sulphurets. The centre and east veins can be traced continuously through the claim, and the three veins are not more than 80 feet apart.

The *Homestake* adjoins the "Old England" on the north end. The centre and east veins of the "Old England" have been traced through this claim. A tunnel to tap the east vein has been commenced and run about 60 feet about the centre of the claim. A prospecting tunnel of some 30 feet has been run lengthwise on the east vein. The character of the ore is gold quartz, containing copper.

The *Le Roi* and *War Eagle*.—Messrs. Copeland and Younkin, the owners of these claims, have sunk a shaft of about 25 feet by 8 feet by 10 feet. They have about 100 tons of ore on the dump. These claims were located in the spring of 1896. Assays average about $30.

A very considerable amount of prospecting and a certain amount of development work has been done on Keremeos Creek and along the Similkameen Valley, and at Osoyoos Lake, on Kruger Mountain. Many new location are in process of development.

Following is an abstract of the mining records and free miner's certificates issued in this Division for the year 1896:—

Free miner's certificates issued	167
Claims recorded	303
Certificates of work issued	111
Permits to re-locate	3
Abandonments	2
Bills of sale recorded	87
Bonds and agreements recorded	25
Water grants recorded	3
Certificates of improvements issued	1

PLACER.

White's Bar, situated on the north fork of Rock Creek.

Five claims have been worked on this bar during the year 1896, but only about $700 has been taken out.

Considerable prospecting work has been done with a view of testing the bar, but as yet with no great results. Good pay, it is thought, could be had if the bottom of the creek bed were reached, but the outlay required to attain this object would necessarily be heavy.

The *Ah Mat* China Company, placering at the mouth of Rock Creek and on Rock Creek, have taken out in the neighbourhood of $6,000 during the past year, several of the partners in this concern having recently sold out and returned to China.

There are five claims belonging to the company.

KETTLE RIVER MINING DIVISION.

The following is taken from a report furnished by Mr. Wm. G. McMynn, Mining Recorder for the Kettle River Mining Division:—

The mineral development and progress generally of this division during the year 1896 has been very marked and encouraging.

During the past year there have been more free miner's certificates issued, and more location, conveyance and certificate of work records made in this district, than during the whole of the previous three years.

The following table will show at a glance the progress which has been made since the Kettle River Mining Division was established, and a Mining Recorder's office opened, in the year 1893:—

ABSTRACT.	1893	1894	1895	1896
Free miner's certificates	194	202	451	957
Location records	102	93	771	1279
Certificate of work records	66	85	140	566
Conveyance records	59	55	244	713
Certificate of improvements	....	3	11	15
Mill site leases	....	....	3	1
Abandonments	6	....	12	35
Water grants	1	3	3	3
Permits	....	....	3	9

The total amount of work done this year on assessments alone, valued at $100 each, would aggregate the sum of $56,600, and it is also pleasing to note the very marked increase in conveyance records, which tends to indicate that this work "pays." Of course on a great many of these claims much more work has been done than is required to hold them under the "Mineral Act," and a few of them I might mention as examples, viz.:—

Graham's Camp.

On the *Potter Palmer* mineral claim a tunnel has been run 61 feet in length.

Smith's Camp.

On the *Last Chance* mineral claim a shaft has been sunk about 65 feet in ore showing some native silver, and on the *Golconda* and *Iva Lenore* mineral claims shafts have been sunk about 40 feet each.

Deadwood Camp.

On the *Mother Lode* mineral claim work was commenced about the middle of last September by the Boundary Mines Co., and a tunnel was started in the hill-side so as to cross-cut the ore body. The maximum depth that will be reached in this tunnel is about 100 feet. The tunnel is now into the hill about 135 feet, and for the last 93 feet has been continuously in ore, which seems to be gradually improving as depth is gained. The ore body at this point is probably 150 feet wide.

An option was secured last June, for nine months, on this claim by John Weir for the Boundary Mines Co. for the sum of $14,000—10% cash, 45% to be paid in six months (which has been duly paid), and the balance due in nine months, viz., next March, when, without doubt, this payment also will be made.

Copper Camp.

On the *Copper Mine* mineral claim (which was bonded last May for six months to the American Exploration Co., of New York, for the sum of $30,000—10% of which was cash), several cross-cuts have been run on the surface at various points to test the width of the vein. Near the lower end of the claim a shaft was sunk to a depth of 50 feet, starting on the porphyry contact, and cutting through ore into the lime foot-wall. From the bottom of this shaft a drift was run to strike the ore body, and then a cross-cut was made through the ore to the porphyry wall, a total distance of about 85 feet from the bottom of the shaft. Some very good ore was found in this shaft, assaying as high as 27% copper, but ore in the cross-cut was lower grade. So far as explored, the vein lies very flat, but may straighten with depth.

This bond was allowed to mature without being taken up by the above-named company.

Providence Camp.

A shaft has been sunk on the *San Bernard* mineral claim to the depth of 75 feet, and a drift of 15 feet, with cross-cut. This vein is small, but carries very rich silver-gold ore.

On the *Combination* mineral claim a shaft has been sunk 35 feet, also showing up rich silver-gold ore.

Skylark Camp.

The *Skylark* mineral claim, which was fully described in my last year's report, was bonded, together with the *Denver* mineral claim (which is its northerly extension), to Mr. C. Rueger, of Butte, Montana, during the month of last May, for the sum of $15,000, viz., $7,500 cash, and the balance of $7,500 to be paid on or before the 30th day of last November. Mr. Rueger shortly afterwards started further development work on the *Skylark* claim, with evidently very satisfactory results, as the last payment of $7,500 was duly made, and Mr. Rueger still continues the work on this property.

Central Camp

(which includes White's, Atwood's, and Douglas' Camps).

The *Number Seven* mineral claim was bonded last May to Mr. John Weir, for the Boundary Mines Co. of New York, for the sum of $13,200.

A shaft was then down on this claim about 40 feet, and since then has been continued to a depth of 140 feet. From the bottom of this shaft a short cross-cut was run to reach the ore body, which had been left in the shaft about the 70-foot level, and, when found, a drift was run alongside of it for a distance of about 60 feet. This ore is found to be of good grade throughout. In the opposite direction, from the bottom of this shaft, a tunnel was run to cross-cut the large quartz ledge which runs parallel to the smaller ledge on which the shaft is sunk, and is on the surface, about 130 feet from it. At a distance of 115 feet in this tunnel from the bottom of the above-mentioned shaft, a quartz deposit was found, but it bears no resemblance to the surface ledge, and at the present time this tunnel is being continued in the same direction.

Provided work is continued on this claim, the bond on it is good until the 15th day of next February, when, there is little doubt, the last payment in full will be made.

On the *Gold Dollar* mineral claim, in the same camp, an incline shaft has been sunk about 40 feet, with a drift of 10 feet, and at the bottom of another shaft 25 feet deep a tunnel has been run a distance of 50 feet.

WELLINGTON CAMP.

A considerable amount of development work has been done during the past year by the individual owners of the different mineral claims, especially on the *Golden Crown*, *Winnipeg Jim*, and *Buttercup*.

GREENWOOD CAMP.

On the *Old Ironsides* mineral claim a shaft has been sunk 70 feet. On the *Gold Drop* mineral claim a tunnel has been run 100 feet to cross-cut the ledge; also a shaft sunk to the depth of 50 feet, showing up a fine body of copper-gold ore. This claim was transferred during the past year by the original locator, Mr. Joseph Hetu, to Mr. Frederick C. Innes, of the City of Vancouver, for the sum of $15,000.

The *Snowshoe* mineral claim has been prospected by a number of holes, driven by a diamond drill to a depth of over 100 feet.

On the *Stemwinder* mineral claim a new shaft has been sunk to the depth of 65 feet, and a cross-cut at the 50-foot level of 15 feet, which is said to show up a body of gold-copper ore assaying $40 per ton; also a cross-cut tunnel has been run about 75 feet in order to connect with the old workings, and a winze sunk on the ore about 30 feet.

SUMMIT CAMP.

A shaft has been sunk on the *R. Bell* mineral claim about 100 feet deep, and on the *Oro Denoro* claim a tunnel has been run about 35 feet in length.

LONG LAKE CAMP.

On the *Alice* claim a shaft has been sunk 50 feet, and on the *North Star* claim another shaft sunk 65 feet.

On the *Lake View* mineral claim a tunnel has been run in on the ledge for 100 feet.

ON THE NORTH FORK OF THE KETTLE RIVER.

A great amount of development work has been done during the past year, but chiefly by the individual owners of the different claims, although lately a number of joint stock companies have been formed to work these properties.

On the *Pathfinder* mineral claim a shaft has been sunk 30 feet, with a cross-cut of 25 feet, all in ore, which is said to assay $22 in gold and copper, and lying between a formation of diorite and porphyry.

On a claim, near the "Pathfinder," called the *Standard*, a 40-foot cross-cut in similar ore has been run.

On the *Columbia* claim, on Volcanic Creek, a drift has been run 30 feet.

On the *Napoleon Bonaparte* mineral claim, which lies between Volcanic and Boulder Creeks, a 40-foot shaft has been sunk. And on the *Bonanza* claim, lying between Cedar and Lynch Creeks, a 50-foot shaft has been sunk, and it is intended to continue development work throughout the winter on this claim.

On Pass Creek, which drains the country from Summit Camp and Long Lake Camp into Kettle River, a number of new locations have been recorded during the past year and on some of them a large amount of work has been done, with encouraging results.

On the *Iron King* and *Kupper Queen* claims 60-foot tunnels have been run.

On the *Twins* and *Blue Ridge* claims 40-foot cross-cuts have been driven; and on the *Garnet* and *King Bee* claims about $700 dollars expended in development work.

Round Christina Lake a few new locations have been recorded, and development work has principally been done by the owners themselves.

On Boundary Creek, about 10 miles north of Greenwood City, a great number of new claims were recorded this fall, and the prospects of another flourishing camp, which is now called "Kimberley," are very good.

A number of new claims have also been discovered this season around the mouth of Rock Creek and on Kettle River; further up, at James and Cedar Creeks.

Only three new placer claims have been recorded in this division this year, viz., one at Boundary Creek and two on tributaries of the Fourth of July Creek, representing in all eleven interests.

Annexed is the statement of the mining revenue for the Kettle River Mining Division for the year ending 1896:—

Mining receipts general	$7,240 45
Free miner's certificates—945 at $5, 3 at $10, 1 at $15, (substituted) 8 at $1	4,778 00

No quantity of ore has been shipped from this district during the year 1896, so far as I have learned.

VERNON MINING DIVISION.

The following is Mr. Tunstall's report, the Mining Recorder for the Vernon Mining Division:—

You will perceive that this report is one of the best since the division was created.

The outlook for 1897 is still more promising. There have been incorporated during the past year three companies, the particulars of which I attach.

Morning Glory Mining Co., Limited.—Treasury stock, 300,000 shares; nature of ore, gold-bearing quartz, with white iron.

The hanging wall or country rock is granite, with the foot-wall the same. Average width of vein, 6 feet, traceable on the surface for a distance of 400 feet, in a westerly course. A shaft 80 feet in depth has been sunk on the vein here, 4½ to 5 feet wide, and showing signs of widening, and the ore extracted has given assays of $37.60 and $39.40 in gold, and about 4% copper.

Camp Hewitt Mining and Development Co.

Incorporated in December, 1896; capital, $1,000,000 in $1 shares; working capital 500,000 shares at 10 cents. This company owns eleven claims.

The *Lake View*.—The ore on this claim is copper and iron-pyrites, carrying gold and silver, and sample assays have run $87 in gold and copper, and $10 in silver.

The *Gladstone*.—A shaft has been sunk on this claim for 15 feet, the width of the vein being 3 feet of solid ore. Assays run $67 and $45—gold, $4; silver, $8; copper, $33.

Silver Star Mining Co.—Capital, $100,000; shares at $1; shares sold, 3,700, at par. A shaft, 26 feet, has been sunk. The ledge is about 5 feet in width, with a dip of 20° south, the foot-wall being black argillites, and the character of ore galena and iron sulphides, carrying gold. Assays, silver, $50, gold, $8, from samples taken from the surface.

Bachelor mineral claims, Nos. 1 and 2.—On No. 1 a 30-foot shaft and on No. 2 a 10-foot shaft have been sunk on the dip of the vein, the foot-wall being composed of porphyry, the hanging wall of granite, and the width of the vein from 3½ to 8 feet. The character of the ore on these claims is iron sulphides, carrying gold. An assay was taken at a depth of 10 feet, which ran $22 in gold. At the surface assays run in gold $480.

I append an abstract of the mining receipts for the Vernon Division for the year 1896:—

Claims recorded	215
Certificates of work issued	50
Transfers recorded	44
Free miner's certificates issued	247

THE BOUNDARY CREEK DISTRICT.

By S. S. Fowler, A.B., E.M., Nelson, B.C.

The Boundary Creek portion of the Kettle River Mining Division of Yale, two years ago, meant a territory of about 150 square miles in extent, drained by a small stream which joins Kettle River from the north at Midway, where the river first crosses the International Boundary. To-day the term "Boundary" has lost its special significance by reason of the rapid extension of the area in which valuable minerals are found, to points far distant from the nucleus which first gave the district its reputation.

The records of the Government Office at Midway showed, on the 1st of January, 1895, that there had been staked, up to that time, about 370 claims, many of which were of course re-locations. On the 1st of January, 1896, all but 127 of these old claims had ceased to exist; but in the year 1895 771 new locations were made, and during 1896 the number was 1,279.

This sudden taking on of a new life, in 1895, was largely due to an influx of prospectors from Trail Creek; while in 1896 it may be attributed, in a great measure, to the failures experienced by the many men who rushed into the Colville Reservation after its opening, by Act of Congress, to mineral locations in February of that year.

The result has been that although the great majority of locations are in that part of the country drained by Boundary Creek, where the first claim was staked by W. T. Smith in May, 1886, many hundreds are scattered all the way from east of Christina Lake, near the eastern confines of the district, westward to the 119th meridian near the mouth of Rock Creek, a distance nearly 40 miles; and from the International Boundary northward for twenty miles, up the valleys of the main Kettle River, Boundary Creek and the North Fork (of Kettle River).

The valleys and water-sheds of these three southerly flowing streams form three natural parts of the Kettle River Mining Division, all connected by several transverse valleys. Each of these parts deserves special consideration, and each has already begun to be known by a name of its own, as its future and even present prospects demand. The central one or "Boundary," however, is the oldest and best known, and because it possesses features common to the others, as well as many peculiar to itself, it is made the subject of this article.

TOPOGRAPHY.

The topography of the district, while it affords a considerable diversity, is not very different to that of all the great interior plateau of British Columbia. Whilst mountainous, its highest points seldom exceed 5,500 feet in altitude above the sea, and the greater number of its many well rounded mountains do not exceed 5,000 feet—Kettle River, at the mouth of Boundary Creek, being about 1,800 feet above sea level. The ruggedness and nakedness of many parts of Kootenay are not at all in evidence, for these rounded hills are splendidly forested to their very summits, with a very great variety of coniferous trees. The eastern, southern and western slopes are open and afford a prolific growth of bunch-grass, and along the valleys are many ranches which are specially adapted to diversified farming with the aid of irrigation.

CLIMATE.

The climate the year round is all that one can desire. The mean temperature for the year ending June 30th, 1896, was 42.8 degrees, and the total precipitation was 13.3 inches.

GEOLOGY.

The geological features of this region are varied and interesting. Not having made a special study, and without assuming more than a general understanding of them, I may say that for several miles east of the North Fork there is an area of Archæan gneisses and siliceous and micaceous schists, which are the basal rocks. West of the North Fork we come into an extensive series of metamorphic schists, quartzites, crystalline limestones and some clay slates, all of which form a large part of the ridge lying between North Fork and Boundary Creek. This series is apparently repeated through a distance of three or four miles west of Boundary Creek, when these probably pre-Cambrian rocks are found to be overlain by Devonian or Devono-carboniferous limestones, which form the summit and western limit of the Boundary Creek watershed, within that part of the latter at least, which is best known. West of this summit is a series of Cretaceous sandstones and shales continuing to Rock Creek, eight or ten miles. Through this series the last-mentioned limestones may be seen protruding at points along Kettle River; but after crossing Rock Creek the schists and quartzites again appear in the vicinity of Camp McKinney, and these in turn are succeeded, on nearing the valley of the Okanagan, by a recurrence of the Archæan rocks first mentioned.

Throughout this extent of territory these stratified rocks are found to be penetrated by, or underlain and overlain by, eruptive rocks of different ages and diverse natures. These eruptives are all more or less intimately associated with the mineral deposits of the district, and a thorough knowledge of them (to be derived only from a comprehensive and accurate geological survey) is much to be desired.

Avoiding more technicalities than are necessary, these eruptive rocks include granite, syenite (?), felsite, trachyte (both often porphyritic) and "diorite." The felsite and trachyte often pass under the name of "porphyry." The "diorite" is meant to signify all those basic, heavy, hard and dark coloured rocks which, scientifically, may properly be called by other names; the term is much burdened, as porphyry has been for many years, but it is convenient and not inexcusable.

The granites are probably the oldest eruptive rocks hereabouts. They are found in the valley of Boundary Creek, about eight miles above its mouth, and from there northward. Diorite, including the lighter coloured varieties, is the predominant eruptive rock, and occurs throughout the region in dykes of greatly varying width, with a strike somewhat north of west. These penetrate the granite and all the other rocks, except possibly the more recent limestones and porphyry, as at the head of Copper Creek.

The porphyritic rocks are prominently associated with the limestone and the Cretaceous strata.

Besides these, considerable areas are known to afford schistose rocks, essentially composed of magnesian minerals, such as chlorite, hydro-micas and talc, together with serpentine and dolomite. A large part of these rocks are probably alterations of an eruptive original, and they are especially in evidence in the southern part of Boundary Mountain, as at White's and Attwood's camps.

Ores and Ore Deposits.

The Boundary District is essentially a gold district. The great bulk of the ores is a mixture of the various iron sulphides with copper pyrites, all more or less auriferous. This class of ore is notably associated with the basic eruptive rocks, which are of so widespread occurrence in southern British Columbia, and with the older metamorphic rocks near or at the contacts of these with the former. The magnesian rocks above referred to also afford this ore. This mineral mixture occurs in bodies which at times are so elongated as to give the impression that they occupy fissures, and again at others it occurs in apparently isolated shutes of limited horizontal extent; finally what seem to be well-defined blanket deposits hold the ore. The croppings of several of these deposits consist of very large masses of (frequently polaric) magnetite, through which are disseminated copper and iron pyrites. Where denudation and wearing action have had sufficient opportunity these cappings have been removed, and calcite, specular hematite and quartz appear as the normal accompanying gangue. This class of ores has a wide range in value, but, excluding the extremes, may be said to carry about $15 in gold, with two or three ounces in silver, per ton, and five per cent. copper. It is exemplified by many of the prominent properties of the district, among which are the "Emma," and "Oro Dinero" in Summit Camp; "Stemwinder," "Gold Drop," "Knob Hill," and "Snowshoe" in Greenwood; "Winnipeg" and "Calumet" in Wellington; "City of Paris," "Lexington," "Golden Rod" and "Oro" in White's Camp, and the "Mother Lode," "Sunset," and "Great Hopes" in Deadwood Camp.

In the granites along Boundary Creek and in the siliceous rocks by which they are flanked—in other words in the more acidic rocks—fissure veins of varying width are found, which afford quartzose dry silver ores and some large bodies of presumably partly free milling gold quartz. In the former case the minerals present with the quartz include small amounts of galena, zinc blende and iron pyrites with ruby silver, &c., as in the Skylark Camp; and in the vicinity of Long Lake, beside the above, tellurium and tellurides of gold and silver, with more or less free gold at the surface, are found. All these dry silver ores contain gold. Their veins are from a few inches to five or six feet in width, and the greater part of the value is often concentrated in a narrow pay streak. An idea of the values of this material is had from the statement that in 1891 a shipment of 85 tons of sorted ore was made from one property, and the metal contents were 16,917 ounces silver, 101 ounces gold, and 7,836 lbs. of lead. Small shipments from other claims have been made, showing gross values of about $100 per ton, but the average value of unsorted ore may be placed at about $50 per ton.

These ores are found over a considerable part of the district, and notably on the "Jewel" and "Dinero Grande" claims in Long Lake Camp; "G. A. R." and "D. A." in Providence Camp; "Skylark," "Crescent" and "Last Chance" in Skylark Camp; "Nonesuch," "Boundary Falls" and "Ruby" in Smith's Camp, and the "No. Seven" and "Lincoln" in Attwood's and White's Camps, respectively, the latter affording grey copper as the principal source of value.

The milling ore mentioned above occurs on the "O.B." and "Big Ledge" claims, south of the "D.A." It affords values from $15 to $40 per ton.

The Devonian limestone, which extends north and south from the head of Copper Creek, is cut through by several dykes of porphyry and felsite, and along the contacts of these with the limestone are bodies of copper ores. In the southern part of this belt the mineral is copper glance and copper pyrites, the latter of which in places seems to be a constituent of the felsite. In the Copper Camp the ore is entirely in the contacts, has a quartz gangue, and is almost entirely copper glance, oxidized at surface and partly again reduced to metallic copper. These ores, while they carry only a small amount of the precious metals, sometimes give assays of over thirty ounces in silver. The copper tenure is about seven or eight per cent. only, but this grade could probably be improved by wet concentration of the sulphide.

This class of ore is found on the "Copper Mine," "King Solomon," "Copper Queen," &c., in Copper Camp, and the copper pyrites and some copper glance are found on the "Bruce," "Texas" and other claims in Graham's Camp, four miles west of Midway.

Coal Measures.

The Cretaceous rocks carry no metallic minerals as far as I know, but for some distance along Kettle River, from four miles west of Midway, they show occasional croppings of coal. Up to the present time the best of these is near the mouth of Rock Creek, where the seam is about four feet thick. Although prospected to a very limited extent this coal appears to be quite up to the average Cretaceous coal in quality, and it has undoubtedly been brought to its present stage as a coal by the heating and distilling influence of the abundant trachyte (?) flow of this vicinity.

The analyses of this coal, which have been made up to the present time, have been of samples from the immediate surface, which is much broken and has absorbed impurities from the overflow of Rock Creek. I give two of these analyses by the Messrs. Guess Bros., of Midway, as follows:—

	No. 1.	No. 2.
Fixed carbon	65.5	68.85
Volatile matter	28.3	15.7
Ash	6.2	15.44

Omitting from consideration the locations of 1895 and 1896 as of two recent date to have produced definite results, the present state of development of the older mineral claims in the Kettle River country is not such as their resources should have made it; although of the one hundred and twenty-seven valid claims shown of record at the end of 1895, but located prior to that year, probably over fifty can show an expenditure of five hundred dollars each. And yet the required assessment work on these one hundred and twenty-seven claims shown by records to have been done is over $40,000, which means that those claims which have received less than $500 worth of work have, on the average, done twice as much as the law requires. Nevertheless, without an attempt at accuracy, I think I am safe in saying that there are not more than three shafts over one hundred feet in depth, and not over thirty shafts between fifty and one hundred feet deep. This is simply another way of saying that outside capital has cast no more than a passing glance at the district. Another reason for the lack of further development is that many of the deposits are so large that they are really discouraging to the owners, most of whom, as usual, are men of limited means, not to say actually poor. For the same reason, when the owner has performed what the law requires for his maintenance of title, he has really accomplished little, and as likely as not failed to work his ground at a point which might have shown better results.

In other words, these very large surface showings require a proportionally large expenditure for the proof of their worth.

Of course the chief want of Boundary is cheap transportation. Even the high grade dry ores of the district can do little more than bear the burden of sixty or seventy miles of waggon haulage when added to the other necessary expenses. So much the less then can the low grade sulphide ores be profitably exported.

With a railway system in operation it is doubtful if a well equipped smelting plant adapted to the treatment of these ores could not be profitably operated in the district; for with the certainty of abundant ores of varied character, as pure limestone as can be desired, and an apparently excellent metallurgical coal at hand, no other material is needed. But the railway under ordinary circumstances will wait until the production of tonnage, either directly or indirectly dependent upon the mineral resources.

To those who are already interested in the Boundary District the necessary tonnage seems to be in sight, but whether this has been proven to the satisfaction of those upon whom the railway builder is dependent remains an open question. Thus again we are brought face to face with the immediate necessity of an ample and well directed mining capital, which is certain to meet with its just reward.

NOTES ON CAMP McKINNEY, B.C.

The camp is situated about 56 miles from Penticton, at the south end of Okanagan Lake. It is eight miles north of the International Boundary Line, and 32 miles west of Midway, at mouth of Boundary Creek on Kettle River. Altitude, 4,600 feet. The camp lies on a rolling plateau spur of a rounded mountain mass, of which Bald Mountain is the centre. This peak, 4 or 5 miles north-west of the camp, is a dome of granite (so I am told), which has been pushed up under the gneisses which lie west of it nearly to the Okanagan and the Cambrian (?) schists and quartzites, which extend east of it for a long distance. Bald Mountain is about 7,000 feet alt. These quartzites, etc., are highly tilted, and at Camp McKinney strike about north and south. Cutting these at right angles is a fissure vein (strike east and west, dip vertical) of quartz, on which are located the "Okanagan," "Amelia," "Cariboo," "Alice," "Emma," "Maple Leaf" and "Eureka" claims. Through all of them the vein is traced, and more or less proved.

Most of the work, and in fact the only work which amounts to much, is on the "Cariboo" and "Amelia," the property of the Cariboo M. M. & S. Co., of Spokane. This company erected a ten (850 lb.) stamp mill in the spring of 1894, which has been in operation with success ever since. The ore carries about 3% of concentrates, that are shipped to the coast smelters, *via* Penticton and C. P. R.

The mine is worked now through a shaft 170 feet deep, from which drifts run east and west. Tne several shafts and winzes foot up about 250 feet, and total drifts and cross-cuts, etc., about 2,000 feet.

The published reports of the company show that about $250,000 in gold have been produced, out of which about $125,000 have been paid in dividends, and about 18,000 tons of ore have been milled.

The only other property which is being worked is the "Victoria" and "Old England" claims, about 3 miles east of Camp McKinney, but no details are available as to the work being carried on.

COAL MINES.

BY A. DICK, INSPECTOR OF MINES.

I have the honour, as Inspector of Mines, to respectfully present my report for the year ending 31st December, 1896, for your information, in accordance with the "Coal Mines Regulation Act" of British Columbia.

The collieries in operation during the past year of 1896 were:—

The Nanaimo Colliery, of the New Vancouver Coal Mining & Land Company, Limited.

The Wellington Colliery, owned by Messrs. R Dunsmuir & Sons.

The Union Colliery, owned by the Union Colliery Company; and

The West Wellington Company, owned by the West Wellington Coal Company, Limited Liability.

The output of coal for 1896 amounted to 894,882$\frac{8}{20}$ tons, produced by the several collieries as follows:—

	Tons.
The Nanaimo Colliery	320,575$\frac{13}{20}$
The Wellington Colliery	339,896$\frac{15}{20}$
The Union Colliery	233,610
The West Wellington Colliery	800
Total output for the year 1896	894,882$\frac{8}{20}$
Add coal on hand 1st January, 1896	33,450$\frac{13}{20}$
Total coal for disposal, 1896	928,333$\frac{1}{20}$

The export of coal by the collieries for 1896 was 634,237$\frac{16}{20}$, as follows:—

EXPORT.

	Tons.
The Nanaimo Colliery	232,436$\frac{11}{20}$
Wellington "	235,916$\frac{5}{20}$
Union "	165,885
Total coal exported in 1896	634,237$\frac{16}{20}$
Add home consumption in 1896	261,983$\frac{12}{20}$
Coal on hand 1st January, 1897	32,111$\frac{13}{20}$
Total	928,333$\frac{1}{20}$

The returns for the year show a home consumption of coal amounting to 261,983$\frac{12}{20}$ tons, as against 188,394 tons last year (1895). It must, however, be noted that the coal used in the collieries is, in most instances, under this heading.

In addition to the above home consumption of coal for 1896, we imported into British Columbia 21,059 tons, and 670 lbs of coke. Of this there came direct, 9,822 tons from the United States to Nelson, and from all appearances we may expect to see this market for coke in British Columbia growing both in the Kootenay and in the Coast districts. We will also expect to see this market supplied with coke from the mines of the Province. At present the Union Colliery at Comox can supply all the coke that is required in British Columbia, and with a first-class article equal to any that can or may be imported. The fixed ash in this Union coke is 8.5 per cent., so that a trial of it will speak for itself, of which 1,240$\frac{12}{20}$ tons was manufactured during the past year, giving great satisfaction.

The coal exported was shipped at the Port of Nanaimo, Departure Bay and Union (near Comox) on Vancouver Island, in British Columbia. The exports were principally made to San Francisco, San Pedro and San Diego, in California, U.S.A Shipments were also made to the

States of Oregon and Washington, and to Alaska and Petropavloski, and the Hawaiian Islands. In order to show the standing of the British Columbia coal in the Californian market, I append the following returns for the year ending 31st December, 1896:

Californian Market.

Where From.	Tons.
British Columbia	551,852
Australia	273,851
English and Welsh	156,368
Scotch	8,356
Eastern (Cumberland and Anthracite)	17,907
Seattle, Franklin and Green River	128,917
Carbon Hill and South Prairie	255,293
Mount Diablo and Coos Bay	110,237
Japan	2,247
Total	1,505,660

Included in the above statement of annual supplies are the quantities received at Port Angeles and San Pedro, aggregating 154,875 tons for the two places, so that the quantity of coal taken into the Californian market during the past year was over 10% less than in 1895.

The total arrivals of coke into California for the year have been 36,132 tons. This is 50% more than in 1895. Fully 75% of this coke was imported from England and Belgium. Now that the owners of the Union Colliery at Comox, B.C., have begun the manufacture of coke on a large scale, having now 100 ovens from which they are turning out a first-class article, they have begun to make regular shipments to California, where it finds a ready sale. These shipments of coke, it is expected, will lead to a decrease in the importations to California from the countries already referred to. These ovens will also supply the Kootenay District, where there is a good demand for coke of such high quality for the smelters. A market for a limited quantity will also be found in Vancouver and Victoria.

NANAIMO COLLIERY.

I have, already, in a previous report, made mention of this colliery, which is owned by the New Vancouver Coal Mining and Land Company, Limited, with head offices in London, England.

No. 1 Shaft.

No. 1 shaft is situated within the limits of the City of Nanaimo. It has proved valuable property, and has been the principal producing mine of the Nanaimo Colliery. Taking appearances as an indication, I may say that it contains a sufficiency of coal to give employment to a large number of men for many years to come.

With the exception of the shaft and a small area around the shaft bottom, the workings of this extensive mine are under the waters of Nanaimo Harbour, and beneath the surface of Protection (or Douglas) Island and Newcastle Island, both in the Gulf of Georgia, most of the working faces being at present under the last named island. The workings of this mine are for the most part dry, but not dusty, and are quite safe from any influx of water, there being a thickness of rock and earth varying from 450 to 1,300 feet between the bed of the harbour and the workings of the mine. These workings are carried on on the pillar and stall as well as on the panel system. The pillars (coal) are large, and contain fully two-thirds of all the coal that was originally in the mine, and are purposely left of large dimensions to protect the mine from the pressure of the large superincumbent and weighty body of water above it. These pillars, after they have served their purpose, will be gotten out at some future day. At present they are a paramount necessity to the safety of the mine.

With the exception of the slope, the only workings from this No. 1 shaft is what is known as the No. 1 north level. The level itself, has not been extended during the past year, but workings from it (the level) have been extended in 1,100. The coal found under the north side of Newcastle Island is generally hard, and of the usual good quality, and is from three to twelve feet thick. It is overlaid by a strong rock roof, but in some places this roof is much cut up with "slips," which make it very dangerous.

No. 3 LEVEL.

There has not been much mining done here during the past year, but in this level, as in No. 1, there is a great field of coal in the pillars, which have not as yet been taken out. As all these (pillars) contain good coal, their removal will prove very remunerative to the Company, the "dead" work being all finished.

THE SLOPE.

The slope has been mentioned in a previous report as being down 1,500 feet, in a northerly direction. During the past year it has been continued, without any intermission, until it is now down 1,900 yards, and is 1,300 feet under "tidal" water. I am sorry to say there is as yet but very little coal. In pushing the work, indications of soon having the coal appear, but these indications again change for the worse, and so on. The place where the coal ought to be is always there, but it is generally filled with rock or soft coal, or both combined. This slope and No. 1 level are the principal exploring places in the mine, and it will be a great relief to the management when they get good coal in both or either of those places, which I hope will soon happen.

The ventilation is good, the supplying motor power being a large "Guibal" fan 36 feet in diameter, and twelve feet wide. When I was down in December there were 44,100 cubic feet of air passing per minute for 120 men and 18 mules. This mine is ventilated on the separate split system, with Protection shaft as the "intake." To the level and inside incline (or panel) there were 12,600 cubic feet of air passing per minute, for 56 men and 6 mules, and to the outside panel or (long incline), 14,500 cubic feet, for the use of 64 men and 12 mules. In addition to the above there were 17,000 feet going, to keep the old works clear from gas, both in No. 1 and No. 3 level old works. The total amount for slope aud shaft is 23,000 feet. In the No. 1 level, great care is taken to prevent the accumulation of coal dust, which, as you are doubtless aware, has, by modern experience, been proven to be a dangerous explosive. This dust is carefully swept from the sides and roof and other places of lodgement in the level and carefully disposed of. It is in this No. 1 level that the coal is being hauled out by electricity. It is no uncommon thing to see 90 cars in one train being rapidly moved by this new motive power. Those who may be desirous of obtaining a description of the system in vogue here, can do so by reading my report of 1894. The system has proved quite a success. It is now working for a distance of 5,600 yards from the bottom of the shaft.

PROTECTION ISLAND SHAFT.

This is also the property of the New Vancouver Coal Co., and is situated on the south point of Protection Island.

This mine opens out from the north and south sides of the shaft, with slope going to the east. These are situated 1,720 feet below the surface, under the entrance to Nanaimo harbour, and are down 1,690 yards. When I say below the surface, I mean to say the surface of "tidal" water. These slopes have been much troubled with faults and with coal of a soft nature. In the upper levels, to the north and south sides of these slopes, the coal has been good and productive, being worked on the pillar and stall system.

On the north side of the shaft is what is known as the "diagonal" slope. This is being driven in a north-easterly direction, being now 1,490 yards long, and 1,200 feet below "tidal" water of the Northumberland Channel. This slope has passed through some very fine coal, but now for quite a distance the management have been troubled with faults and soft coal. The slope is now the only place being worked down here. About 500 yards down this slope there is another branch slope to the eastward. This is now down 750 yards in good coal all the way, but here the large "down-throw" is encountered that has already been crossed in the slope, so that they are now working the coal from both sides on the pillar and stall system.

The ventilation is good, the "intake" being Protection shaft, with No. 2, or fan shaft, in the City of Nanaimo, as the "upcast." This mine is ventilated on the separate split system. When I last examined this mine there were 25,200 cubic feet of air passing per minute to the diagonal and side slopes. This quantity was for 37 men and 4 mules. Down the slope on the southern side there were 18,720 cubic feet of air passing per minute for the use of 42 men and 2 mules. After the air has passed along, it is carried away on the return to the fan-shaft.

No. 5, Southfield.

This mine, as mentioned in my last report, is the property of the New Vancouver Coal Co., and is the southern part of their large estate. The workings of this shaft are all to the eastward. The management have been much troubled here with faults, and have not as yet got clear of them. The coal now mined here is very good and hard, and of good quality. In some places it is 12 feet thick. It is worked on the pillar and stall system, leaving as much of the faulty ground as possible in the pillar.

Ventilation is very good. When I was down in December, there were 36,880 cubic feet of air passing per minute. This was for 56 men and 11 mules. It was divided as follows: 18,000 feet of air per minute, for 30 men and 2 mules, to the east incline; 18,880 feet of air per minute to the east level, for 26 men and 9 mules. This mine is free from dust, and otherwise in good order. In addition to the air current above mentioned, a large quantity goes out by the No. 4 slope, with which this mine is connected.

Prospecting.

Quite a large amount of prospecting has been done by this company, both by "pick and shovel" and by the "bore." At the present time of writing one "bore hole" is down fully a thousand feet, and still have not reached the required depth. On their property close to the "Extension" mine (owned by the E. & N. R. R. Co.), a considerable amount of prospecting has been done by pick and shovel, with the result of opening up a good seam of coal, into which they have driven a slope to a distance of 75 yards. This "find" has the appearance of being what is known commercially as Wellington coal. It is hard and of good quality, and it is hoped that it will lead to the finding of quite an extensive field.

WELLINGTON COLLIERIES.

These collieries belong to Messrs. R. Dunsmuir & Sons, and are situated in North Nanaimo, six miles from the City of Nanaimo. Departure Bay is the shipping point of these collieries, where the Company have erected extensive wharves for the accommodation of the shipping, and which are furnished with every modern facility for the loading of coal.

No. 1 Pit, Wellington.

This pit is near the eastern boundary of the Wellington Estate. It is connected underground with No. 5 pit. In a previous report I mentioned that the mining in this pit consisted of a good deal of rock work, but during the past year, I am pleased to state, a change has taken place, and the pit is now one of the producers of the Wellington coal. As all the coal to the rise of the shaft had been worked out on the long wall system, a slope was put down to near their southern boundary, and in that direction they have found a large extent of coal before them, which is hard and of the usual good quality. It is here they are now working.

Ventilation is good. When I was down in December, there were 16,000 cubic feet of air passing per minute, to supply 35 men. Of the foregoing current of air, 10,000 feet went to No. 5 fan-shaft and 6,000 feet to the return at No. 1 pit. The air goes down the slope and into the level, and returns along the coal face, which is worked on the long wall system. It is also in this pit that a stratum of "fire clay" may be found 30 feet in thickness.

No. 3 Pit, Wellington.

At the time of my last report, the management were having the water pumped out and the pit otherwise cleaned up. Everything went well until the month of October, when a fire broke out in the lower working of No. 4 pit, which necessitated for the third time the introduction of water from the Millstone River to extinguish the fire in No. 4. At the present time this water is being removed by pumps, consequently no mining is going on here.

No. 4 Pit, Wellington.

This is also the property of Messrs. Dunsmuir. This mine has, on two different occasions, been filled with water on account of fires. During the past year it had once again, and for the third time to be flooded to subdue a fire, which had broken out in the lowest part of the mine, and to which I referred in my remarks on No. 3 pit. The water introduced, filled the lowest parts of this and No. 3 pit. The quantity introduced was only sufficient to submerge those places which were on fire, and as they happened to be in the lowest part of the mine, the water did not interfere with the working of the remainder of the pit, as it did not encroach upon the roads or airways. The only delay caused was a month, which was taken up in the introduction of water. The coal mining in this pit is confined to the extraction of the pillars (coal), and as the management know exactly what amount they possess in this form, I am in a position to state that mining will be carried on here for several years to come.

Ventilation is good. From tests taken by me in December, I ascertained that at that time there were 63,840 cubic feet of air passing per minute on the return airway, for 150 men and 35 mules, and supplied in the following manner, viz.: split to the east side, 24,688 feet of air for 60 men; to the slope, 20,540 cubic feet of air per minute for 50 men; to the south side, 15,420 cubic feet of air for 40 men, leaving 3,192 feet of air to be accounted for, and which passed along and into the old workings. In addition to supplying the men already enumerated, this current or supply of air furnished breathing material for 35 mules scattered throughout the mine. Notwithstanding that very little gas is found in this mine, still the greatest care is taken as to the ventilation, so as to obviate all chances of accidents. After the pillars have been taken out, it will not be possible to enter the old workings, but at the present time, the firemen and shot-lighters give these old workings a careful and continuous examination, as to the existence or collection of gas.

NO. 5 PIT, WELLINGTON.

This pit still upholds its record as the greatest coal producing mine of the whole colliery. Much of the coal mining carried on here has been on the "long wall" system; but at present it is from the pillars and stalls that the greatest amount of the coal is obtained. The taking out of pillars (coal) also furnishes a certain amount. The area of coal in sight in this mine justifies me in stating that this mine will work for many years to come. This pit is connected with Nos. 1 and 6 pits by good travelling roads.

Ventilation is good, though at times there is considerable powder smoke after blasting, but this smoke is soon carried away by the excellent ventilation. Observations taken by me in December, showed that there were 90,500 cubic feet of air passing per minute at the foot of the upcast shaft for 185 men. Carried on the separate split system, this air was disposed of as follows; to the east side, 26,300 cubic feet per minute for 62 men and boys; to the side slope, 8,400 feet for 25 men; to the north-west level, 35,400 feet for 65 men; to Nos. 2 and 3 levels, 11,200 feet for 33 men at work there. The balance of air unaccounted for escapes to the fan-shaft, and through the old workings. There is little gas seen in this mine, yet as a precautionary measure in that part of the mine where they are taking out pillars, and where it is impossible to get into the back to examine it, the men work with locked safety-lamps. This pit is free from dust. In addition to the manager, this mine or pit has a staff of assistants, who give a very careful examination to the pit in every detail, and any serious change in the ventilation would be detected at once.

NO. 6 PIT, WELLINGTON.

This is another extensive mine of the Wellington collieries. Coal was first mined here on the pillar and stall system, then with a division on the long wall system, but at present time mining is confined to taking out the pillars, which are all of coal. These are found on the north, east and west sides. The rest of the pit was worked on the long wall system, which leaves nothing to be taken out. There is quite a large area of coal embraced in these pillars. In addition to these pillars, there is still a large strip of coal on the southern side, between this pit and what is known as the East Wellington pit. The coal is here known to be good on both sides.

Ventilation is good. The motive supplying power is a fan worked by steam. My December observations indicated 37,900 cubic feet of air passing per minute, on the separate split system, and was disposed of as follows: to the east level, 20,400 feet per minute for 24 men and 5 mules; to the east incline, 7,000 feet for 14 men and 2 mules; and to the west side, 10,500 feet for 18 men and 4 mules. Each of these divisions has a separate return airway, until they arrive close to the upcast shaft.

EAST WELLINGTON.

No. 1 SHAFT.

In my last report, I stated that this mine was now the property of Messrs. R. Dunsmuir & Sons. During the time which elapsed between the period of the shutting down of this mine under the former ownership, and the taking of it over by its present proprietors, the pit filled with water, and at the time of my last report, I stated that the water had been pumped out, and that a few men were at work in the mine. Work was carried on for a few months getting out coal, but work was stopped and matters came again to a standstill. The only work done here at present is pumping the water out, and keeping the pit dry. What the cause of the stoppage is, I cannot tell.

All the upper works and pit-head gear of No. 2 shaft, were destroyed by fire during the dry weather, which prevailed at the latter end of last summer.

ALEXANDRIA MINE.

This property also belongs to Messrs. R. Dunsmuir & Sons, and lies to the south side of the New Vancouver Coal Co.'s Southfield. There have been some extensive improvements made here during the past year, amongst which is the addition of a large hoisting engine with powerful boiler, capable of taking out of the mine a large amount of coal per day. For the first ten months of the year, they pushed the levels with much energy. They have got what is known as the north level, in about 800 yards from the slope. The greater part of this distance is in good coal. At the present time, no work is going on in the mine itself, but great improvements are being made outside. During the summer a switch was run in from the E. & N. R. R., so that when everything is ready to resume the taking out of coal, it can be shipped immediately to Victoria for sale, or elsewhere for exportation. Large bunkers and other facilities for handling coal are now being built. The coal found in this mine is of very good quality.

Ventilation is good. When I last took observations, there were 9,000 feet of air passing down the slope per minute for only 7 men employed. This mine will certainly give a good account of itself before another year is out.

E. & N. EXTENSION, (WELLINGTON).

This mine is mentioned in a previous report as being situated on the south slope ot Mt. Benson, and is the property of the E. & N. R. R. Co., being included in the railway grant. The Company have been prospecting this property very extensively during the past year. The No. 1 slope is now down 700 yards, in a southerly direction ; the coal being good all the way, and varying in thickness from 6 to 11 feet, and having a return airway to the same. About two miles in a south-easterly direction from No. 1 slope, they have the coal again. Here it is known as the No. 2 slope. At the outcrop, the coal was 15 feet thick. The last time I was there they were working 8 feet of the coal, and they did not know much was over them, as they had not seen the roof since they started. They were then down 80 yards, the coal being hard and of good quality. From all indications, and from what is now known of this field, Douglas District is going to be the great coal producing centre for the next generation.

WEST WELLINGTON COLLIERY.

The mine is west of and adjoining the Wellington colliery, owned by Messrs. Dunsmuir & Sons, and is owned by the West Wellington Coal Co., (Ltd. Ly.) There has been considerable work done here since the above Company purchased this property.

This mine is entered by a slope going in a southerly direction, and heading to under the Millstone River. The coal is found not far below the surface, and is from 4 to 6 feet thick, and is of the usual good quality for which the Wellington coal is celebrated. This slope is not far down, as this Company has only recently commenced operations; but they have already two levels whence they are taking the coal. From the mine they have a second outlet, which serves as a return airway in their ventilating system. The Company has been shipping coal to Victoria *via* E. & N. R. R., where they find a ready sale for all they can ship. Their wharf is situated in Nanoose Bay, distant about six miles, and connected with the mine by means of a wooden tramway. This mine has only recently become the property of this Company, and they are getting the works into good working order, so that we may expect to see this a producing mine, and also stirring times before the year is out.

UNION COLLIERY.

No. 2 Slope.

This colliery is the property of the Union Colliery Co., and is situated near the farming district of Comox. I mentioned in my previous report that this slope was down 700 yards. It has, however, been idle for the past six months. This stoppage has not been due to the want of coal in the working, but on account of the dullness of trade The management has, however, kept the water pumped out regularly, so that when trade revives they will be in a position to resume operations at two days' notice. This improvement in the market I hope to see soon.

No. 4 Slope, Union Colliery.

This slope is the most extensive mine in the Union Colliery, and is now down 2,400 yards, with an easy grade all the way. From this slope, at about 100 yards from the entrance, there branches off to the east, and at an angle of 45 degrees, a slope known as the No. 2 slope, which runs almost on the true dip of the coal. Although not so long, but having a greater dip than No. 1, it is now almost down to the level of the main slope. From this last named slope there branch of on each side, and to the east and west, three levels. These are called 11, 12, and 13 levels. The character of the coal in each of these three levels to the east and west of this slope is the same. It is good and hard, and from 5 to 7 feet thick. In the diagonal slope the coal is about the same in quantity and quality as in the main slope. This diagonal has also three levels on each side of the slope, running to the east and west. The two slopes (main and diagonal) are connected through the No. 11 level.

Ventilation is good. In December there were 55,589 cubic feet of air passing per minute on the intakes for 183 men and 12 mules. From the intake the air was split in the following divisions inside of all the doors :—The first division is where the No. 2 branches off the No. 2 slope at the junction of the diagonal slope, part of the air going down the diagonal and part down the main slope. At this split, by test, I found that there were 24,574 cubic feet of air passing per minute down the main slope. The air is carried down this main slope to the bottom, where it is again split into two separate currents, the one going to No. 13, the lowermost of the levels on the east side. The remaining levels on the west and east sides obtain their air from the No. 13 level on each side. I found at the foot of the main slope, where the split was, that 15,387 cubic feet of air passed per minute into No. 13 level on the west side, to supply 64 men and 4 mules, and 9,187 cubic feet of air to the east side, to supply 28 men and 2 mules. To return to the point where the split existed at the junction of the main and diagonal slopes, I found that 22,168 cubic feet of air passed into the diagonal, and thence into the lowermost level, where it was again split to supply the levels on the west and east sides of the slope. To the west there went 7,075 cubic feet of air, for 31 men and 2 mules, and to the east there went 15,093 cubic feet of air per minute, for 60 men and 4 mules. There are therefore 8,847 feet to be accounted for. This quantity escapes at the doors of the different levels of the slopes ; but it is not lost, as it is caught there and taken into the levels. This mine is free from dust.

All the appliances and arrangements abont this mine are of and on the most improved system for the saving of labour and the handling of coal.

I may mention before completing my remarks upon this mine that when I was down in the course of duty in December last there were no men at work at that time.

No. 5 Shaft, Union Colliery.

This shaft and the machinery are fully described in my report of this mine in 1896. I further stated that the work was at that time at the bottom of the shaft and in good coal. Since that report was written, work has been carried more away from the shaft, and in the course of so doing many troubles and faults were met with. These faults sometimes raised the coal and sometimes lowered it. To make my meaning more plain to those unacquainted with coal mining, I might explain that by raising the coal I mean that the working face would meet with rock, when the coal would be either up or down. If "up," I use the expression "raising" the coal; if down, I use the expression "lowering" the coal. To resume: besides the faults met with, the work would sometimes meet with a "want," by which I mean that the coal would sometimes give out and run into dirt. They have had very good coal to the south, which is worked on the "long wall" principle, and works well, when clear of faults; but in the levels they met with one fault after another, but they expect to get clear of these soon.

Ventilation is good; motive furnishing power being a large Guibal fan worked by a steam engine. In December, when I was there, I found by examination that there were 34,570 cubic feet of air passing down the shaft, where were 46 men and 1 mule. This mine is ventilated on the separate split system, the divisions being, at the bottom of the shaft, as follows:—To the east side, 18,110 cubic feet of air per minute for 30 men; to the west level 16,460 cubic feet of air per minute for 16 men and 1 mule.

In addition to the extensive prospecting done in this colliery, this company has erected near the shipping wharf a "Luhrig" coal washer. This is used for washing the screenings from the lump coal, and gives as a result five different sizes, from "nut" to fine coal dust.

I mentioned in my last report that at that time a contract existed for the erection of 100 ovens for the manufacture of coke, for which the coal from the Union Colliery is well adapted. The foundations (stone) of the buildings were laid in the fall of 1895, and in the spring the company imported a large shipload of fire-bricks and other blocks of the same material, as well as milled clay to complete the buildings. A large number of men were at once put to work, and in the course of time a block containing 100 ovens, having a double front, with 50 ovens on each side, was erected. Between the two sets of ovens is a flue to conduct the gas away which comes from the coal while in the course of being transformed into coke. This gas is utilized by being burned as fuel to generate steam to work the engine. To reiterate this, coke is made from the screenings obtained from the "Luhrig" washer, which would not have been saleable if it had not been for this great and enterprising outlay of money. The coke manufactured at these ovens is a very fine article, and the company is now finding a ready market for its sale in California. Special rates have, I understand, been obtained from the Canadian Pacific Railway Co. for the carriage of coke from these ovens into the Kootenay country, by which the Union Colliery Co. will be able to compete successfully in price with coke imported from the U. S. and elsewhere. There can be little doubt that, as our rich mineral claims become developed, many more smelters will be erected in British Columbia, which will consume more of this superior coke.

ACCIDENTS

In and about the Coal Mines of British Columbia for the year 1896.

January 8—Thomas Gemmall, fireman, and Ah Wing, bratticeman, were very slightly burned about the face and hands by an explosion of gas while at work repairing brattice in the No. 2 slope, Union Colliery.

" 8—Evan Morgan, miner, working in No. 1 pit, Wellington Colliery, was seriously injured by being jammed by a car in the mine.

" 10—Albert Parrott, miner, working in No. 1 shaft, Nanaimo Colliery, got his leg broken by a fall of rock while at work.

" 23—Alexander Rowan, mule driver, was injured about the leg by being jammed between two mine cars while at his work in No. 4 slope, Union Colliery.

" 24—Joseph Wilson, miner, was slightly injured by a fall of coal while at his work in No. 4 slope, Union Colliery.

" 24—Thomas Jenkins, miner, working in No. 4 slope, Union Colliery, was burnt about the face and hands by an explosion of gas.

February 4—William Bray, miner, was killed by a fall of coal while at work in Protection Island shaft, Nanaimo Colliery.

" 8—Joseph Potter, miner, working in No. 4 slope, Union Colliery, was slightly burned. There was a cave on his road, a short distance from the face. This broke down the brattice, and as Potter was taking away the rock he required some tools, and went into the face to get them; hence the result.

February 17—John Nord, miner, working in the No. 1 mine, or shaft, Nanaimo, had a leg broken by a fall of rock while at work in his stall.

„ 19—James Harley, miner, while at work in his stall in No. 1 shaft, Nanaimo Colliery, had his collar bone broken by a fall of coal.

„ 20—Z. Donatto, miner, in No. 1 shaft, Nanaimo Colliery, was slightly burned about the face and hands, by igniting a quantity of loose powder in the mine.

„ 21—John Gray, miner, working in No. 5 shaft, Union Colliery, was slightly burned by a small quantity of gas, which he kindled while at work.

„ 21—George McLean, miner, working in No. 4 slope, Union Colliery, had his jaw broken by being struck with a stringer while in the act of putting it into its place to support the roof.

„ 21—A. Lelland was killed by being crushed between the weigh-house and the workman's car, while attempting to get on the car while in motion, near the No. 4 slope, Union Colliery.

„ 27—Owen Bradshaw, miner, while at work in Protection shaft, Nanaimo Colliery, was slightly burned about the face and one arm, by the ignition of a small quantity of gas.

March 5—George Smith, labourer, working in No. 4 slope, Union Colliery, was hurt about the head and shoulders by a fall of rock while at work.

„ 26—Ah Hee, Chinese runner in No. 4 slope, Union Colliery, had his leg broken by a mine car while at work.

April 10—William Moore, miner, was severely injured by a fall of coal while at work in No. 5 shaft, Union Colliery, and died the following morning.

„ 13—George Hards, boy, running in Protection shaft, Nanaimo Colliery, had his thigh bone broken, by being jammed between a mine car and a prop.

„ 13—Thomas Walker, miner, working in No. 4 slope, Union Colliery, was slightly hurt about the back by a piece of rock while at work in his stall.

„ 22—Caleb Evans, miner, and Ah Creep, labourer, were slightly burned by a blown-out shot in the No. 5 shaft, Union Colliery.

„ 29—William Jackson, miner, had his leg broken by a fall of rock while at work in his stall, in No. 6 pit, Wellington Colliery.

May 6—Ah Yum, labourer, at Union Colliery, while going to his work in the workman's car, and sitting at the window during the time the car was in motion, was struck by a timber of the trestle, from the effects of which he died to-day. The accident happened on the 5th (the day before).

June 2—John Alexander, miner, was killed by a fall of rock while at his work in the No. 5 pit, Wellington Colliery. He was blasting down rock, and went below a piece that had been loosened by a shot, when it came down on him.

„ 10—Charles Gorion, miner, working in No. 4 pit, Wellington, was killed by the giving away of a stringer while at work in his stall.

„ 12—Frank Prime, miner, working in No. 1 shaft, Nanaimo Colliery, had his arm broken by a small piece of rock falling on him while at work in his stall.

„ 25—Fred Turner, brakeman on electro-locomotive, had one arm broken by a piece of rock falling on him; car going off the rails.

„ 25—James Glen, miner, had one of his legs broken by a fall of rock, while at work in his stall in No. 5 pit, Wellington.

July 4—Angus McLellan, miner, got one rib broken by a fall of coal while at work in his stall in No. 5 pit, Wellington.

„ 9—John O'Connell, pusher, in No. 5 pit, Wellington, got his collar bone broken by being jammed between two empty cars.

„ 29—William Thomas, miner, had several of his ribs broken by being jammed by a loaded car against the coal face while at work. He was starting a level off the slant from the diagonal slope Protection Shaft, Nanaimo Colliery.

„ 29—John Naomi, runner, in No. 5 pit, Nanaimo Colliery, had his thigh dislocated and foot severely cut by getting entangled in a rope that he was using for lowering cars down an incline.

August 4—Peter Masuggo and Dominic Valezano, miners, got burnt on the head, face, and hands by an explosion of gas at a cave they were clearing in the No. 5 pit, Wellington.

„ 7—The first-named, Peter Masuggo, died in the Nanaimo hospital to-day.

September 10—R. Hamilton, miner, working in the No. 5 shaft, Union Colliery, was slightly burned on the neck by the ignition of a small quantity of gas.
October 2—Tai Suen, miner, working in the No. 5 shaft, Union Colliery, was seriously injured by coal falling on him while at work in his stall.
" 3—The above Tai Suen died to-day from the injuries received.
" 6—Joseph Nanaivell, miner, was injured about the back by a fall of rock, while at work in his stall, in Protection Island shaft, Nanaimo Colliery.
November 12—Richard Spear, shot-lighter, Protection Island Shaft, Nanaimo Colliery, was severely injured about the body by being thrown from and jammed by a run of loaded cars.
" 16—James Dickie, timberman, in the No. 6 pit, Wellington Colliery, was slightly burned about the face and hands, by gas when going over a cave of rock.
" 16—Thomas Wilkinson, miner, was injured about the head, by a fall of rock, while at work in his stall in the No. 6 pit, Wellington Colliery.
December 2—William Lockhart, miner, working in No. 5 pit, Union Colliery, was slightly burned about the face and hands by an explosion of gas.
" 12—Chee-He-Chung, switchman, in No. 1 slope, Union Colliery, was killed by falling between the mine cars while at work.
" 23—W. J. Pollard, miner, working in No. 1 pit, Nanaimo Colliery, had his leg broken by a run of loaded cars.
" 29—Robert McGargle, miner, working in No. 1 slope, Union Colliery, was burnt on the face and hands, by firing a little gas in a hole in the roof.
" 31—John Bowen, miner, working in No. 4 pit, Wellington, got his arm broken and crushed about the body by a fall of coal while at work in his stall.

It is with sincere regret that I have again at this time, the close of another year, to make out the above long list of accidents, although there is a decrease in their number below that of last year.

Some of the accidents enumerated were quite slight, but on the other hand, some of them very serious. In some of the cases, months elapsed before the man injured could return to his work. In the above list, you will observe that there is a total of 47 accidents, 38 of these being reported as slight, or serious, and 9 fatal. Of the 38 casualties, 5 were from the falling of or injuries from coal, 8 from rock, and 11 from explosions of gas, 2 from shots, 8 from accidents in connection with the cars in the mine, 1 from powder, 1 from a rope and 2 from injuries from stringers. Of the 9 fatal accidents, 3 were caused by falls of coal, 2 by rock, 1 by explosion of gas, 1 with cars in the mine and 2 on the railway, not below but on the surface, so that the number of fatal accidents in the mine is reduced to 7. I have made enquiries into the circumstances and causes incidental to all of these accidents, as soon as possible, after receiving word of their having happened, and on many occasions I have been at the spot before the notice from the manager had reached me. In looking over the list you will observe that nearly all of the accidents mentioned, happenéd while the men were at work in their places. With respect to the fatal accidents, an inquest was held in nearly every case, so that if the minute incidents in connection with the fatalities are required, these can be obtained from the evidence filed with the inquisition, in the office of the Honourable the Attorney-General.

In addition to the workmen who is supposed to use ordinary precautions for his own safety, there is a large staff of men employed to look after and care for the safety of those at work. For instance, there are the manager, overman, fire-man, shot-examiners and many other persons having authority, all of whom are constantly on the move throughout the mine, not being long in one place unless their presence may be required. Fire-men and shot-examiners always have safety lamps with them, so that they may be always on hand and prepared to examine all places where gas might suddenly appear, or where there is any likelihood of this, the most dreaded of all dangers in connection with coal mining existence. All of the old workings that can be got at are frequently examined, the more especially when the men are engaged in taking out pillars (coal). In these cases, examination of the back part is impossible, as everything in the rear has mostly fallen in, and the examination is therefore confined perforce to what is termed as the "gob" or the place in which the refuse is thrown.

I have once more to record that the miners of the Nanaimo Colliery, are as yet, the only workmen that have availed themselves of the privilege allowed them under General Rule 31, "Coal Mine Regulation Act." This privilege is the examination, by a committee of themselves, of the mine and its condition as to safety. The results of these examinations are posted up in a conspicuous place for the information of the men, and also entered in a book kept for the purpose. The workmen have, therefore, the benefit of the results of their own as well as the examination made by the management.

This system is not followed in either the Wellington or Union Collieries by the employees, and I think that it is a great oversight on their part. I have reason to believe that the managers of both of the collieries just named would be pleased if their workmen would take advantage of the privilege referred to, and examine into the condition of the mine at least once a month. It would give the workmen a better idea of the condition of their working places by personal observation, and thereby do away with much friction which should not exist. The manager and the men would better understand each other, and I am also convinced that the manager would give them every assistance in making these monthly examinations.

Although there has been quite a decrease of casualties and fatal accidents in the mines during the past year, there is yet room for improvement that way, as many of the accidents recorded could have been prevented had greater precautions been used; but we will yet hope that our mines may yet be worked so that casualties will be a thing of the past, as they should be if all the means at our disposal were properly used; indeed, if they were now, good results would be sure to follow.

I append hereto the Annual Colliery Returns for 1896.

I have the honour to be,
Sir,
Your obedient servant,
ARCHIBALD DICK,
Government Inspector of Mines.

COLLIERY RETURNS.

WEST WELLINGTON COLLIERY RETURNS FOR 1896.

Output of coal from September to December, 1896.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1896.		No. of tons unsold, including coal in stock, Jan. 1st, 1896.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
800	—	About 800	—	—	—	—	—	—	—

Number of hands employed.				Wages per day.			
Whites.	Boys.	Indians.	Chinese.	Whites.	Boys.	Indians.	Chinese.
12	....	....	1	$2.50	....	....	$1.25
Total hands employed, about 15				Miners' earnings, per day $2.50			

Name of Seams or Pits—West Wellington.

Value of Plant—About $2,000.

Description of seams, tunnels, levels, shafts, etc., and number of same—One slope; seam, 5 to 6 feet thick; 2 levels; no shaft.

Description and length of tramway, plant, etc.—Wooden tramway, about 6½ miles, to Nanoose Bay; 1 steam pump and hoist,

WEST WELLINGTON COAL CO., LTD. LY.,
E. H. HEAPS,
Managing Director.

NANAIMO COLLIERY RETURNS FOR 1896.

Output of coal for 12 months ending December 31st, 1896.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1896.		No. of tons unsold, including coal in stock, Jan. 1st, 1897.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
320,575	13	91,406	8	232,436	11	6,334	10	3,067	4

Number of hands employed.				Wages per day.			
Whites.	Boys.	Indians.	Chinese.	Whites.	Boys.	Indians.	Chinese.
803	53	..	125	$2.37 to $3.50	$1 to $2	....	$1 to $1.25
Total hands employed .			981	Miners' earnings, per day			$3 to $5.

Name of Seams or Pits—Southfield No. 2, Southfield No. 5, No. 1 Esplanade Shaft, No. 1 Northfield Shaft, Protection Island Shaft.

Value of Plant—$350,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—Southfield No. 2, worked by slope, seam 6 to 10 feet; Southfield No. 5, worked by shaft, seam 5 to 10 feet; No. 1 Northfield Shaft, worked by shaft, seam 2 feet to 3 feet 6 inches; Protection Island Shaft, worked by shaft, lower seam 4 feet, upper seam 6 feet; No. 1 Esplanade Shaft, worked by shaft, seam 5 to 12 feet.

Description and length of tramway, plant, &c—Railway to Southfield, 6 miles, with sidings; railway to No. 1 Shaft, 1 mile, with sidings; railway from Northfield Mine to wharf at Departure Bay, 4½ miles; rails are of steel, 56 lbs. per yard, of standard gauge, viz., 4 feet 8½ inches; 8 hauling and pumping engines, 15 steam pumps, 5 locomotives, 238 coal cars (6 tons), besides lumber and ballast cars; bunkers with a capacity of 3,700 tons; fitting shops for machinery repairs, with turning lathes, boring, drilling, planing, screw-cutting machines, hydraulic press, steam hammer, &c., &c.; diamond boring machinery for exploratory work (bores to 4,000 feet); 150 horse-power electric plant engines, boilers, dynamo; 4 30 horse-power 8-ton locomotives, and 1 15 horse-power locomotive; hauling and lighting equipment; wharves, 2,000 feet frontage, at which ships of the largest tonnage can load at all stages of the tide.

SAMUEL M. ROBINS,

Superintendent.

WELLINGTON COLLIERY RETURNS FOR 1896.

Output of coal for 12 months ending December 31st, 1896.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1896.		No. of tons unsold, including coal in stock, Jan. 1st, 1897.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
339,896	15	103,129	4	235,916	5	13,783	3	14,634	9

Number of hands employed.				Wages per day.			
Whites.	Boys.	Indians.	Chinese.	Whites.	Boys.	Indians.	Chinese.
796	72	....	91	$2.25 to $3.50	$1 to $2	....	$1 to $1.50
Total hands employed			959	Miners' earnings, per day			$2.50 to $3.50.

Name of Seams or Pits—1, 3, 4, 5, and 6 Wellington, and 1 and 2 East Wellington.

Value of Plant—$150,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—7 shafts, with slopes, airways, and levels; 3 air shafts.

Description and length of tramway, plant, &c—5 miles of railway, with sidings and branches; 6 locomotives; 250 coal cars; 13 stationary engines; 9 steam pumps; 4 wharves for loading vessels, and bunkers.

Output of fire-clay—286 tons; sold, 286 tons.

R. DUNSMUIR & SONS.

UNION COLLIERY RETURNS FOR 1896.

Output of coal for 12 months ending December 31st, 1896.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1896.		No. of tons unsold, including coal in stock, Jan. 1st, 1897.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
233,610	—	66,648	—	165,885	—	13,333	—	14,410	—

Number of hands employed.				Wages per day.			
Whites.	Boys.	Japanese.	Chinese.	Whites.	Boys.	Japanese.	Chinese.
365	18	132	283	$2.25 to $3.50	$1 to $2	$1 to $1.25	$1 to $1.35
Total hands employed			798	Miners' earnings, per day			$2.50 to $4.50.

Name of Seam or Pits—Comox. Value of Plant—$125,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—No. 2 Slope; No. 4 Slope, with airway and levels; No. 5 Shaft, with airway and levels.

Description and length of tramway, plant, &c.—12 miles railway, 4 feet 8½ inches gauge; 4 locomotives; 150 coal cars (25 tons each); 1 second-class passenger car; 1 combination passenger car; 1 diamond drill; 4 stationary engines; 5 steam pumps; 5 electric pumps; 1 dynamo; 1 steam saw-mill; 1 Luhrig coal washer; 100 coke ovens (Beehive pattern); 2 wharves; 1 pile-driver.

No. of tons of coke sold—416$\frac{12}{20}$ tons. Coke on hand—642 tons.

" " fire-clay sold—126.

JAMES DUNSMUIR, *President.*

REPORT

ON THE

ALBERNI MINING DISTRICT

BY

WILLIAM A. CARLYLE,

PROVINCIAL MINERALOGIST.

BULLETIN No. 1.

THE PROVINCIAL BUREAU OF MINES,
VICTORIA, B. C., JUNE, 1896.

By Authority.
JAMES BAKER,
Minister of Mines.

REPORT

—o—

To the Hon. Col. James Baker,
Minister of Mines, British Columbia.

SIR,—Herewith I have the honour to transmit Official Bulletin No. 1, a report on the mineral deposits and the progress of mining operations in Alberni and on Barclay Sound, Island of Vancouver, B. C., compiled from notes recently taken by me, May 28th to June 10th, on a short visit to the various points in this district where mining and prospecting are being done. I was accompanied by Mr. Herbert Carmichael, Provincial Assayer, who rendered me signal service by his knowledge of the county and assistance in many ways.

On this short tour of inspection no attempt was made to study the general geology of the country as time forbade, and I confined my investigations to those places where ore was reported as found, or where work had been or was being carried on; and as my office calls for no expression of opinion as to the probable value of any property, I will limit my report to a description of what I saw and learned. Since Mr. Wm. J. Sutton made his much more lengthy examination last year very little more work has been done except on two properties, and but little that is new can now be said; however, I was able to inspect most of the leading points of interest and to acquaint myself with many of the conditions that obtain in this district, although I was unable to reach some claims lying further back, on which, as I learned, but little work save prospecting has been done, and at which no men were then at work.

All mining or prospecting except on the placers on China Creek, as seen by me, was in igneous rock, in most cases I believe in diorite or rock closely allied, rock nearly everywhere carrying more or less iron pyrites, that led some prospectors to report exposures of such rock as ledges of great width and in many cases to call this fine grained or aphanitic rock quartz, when in fact but little quartz was seen apart from the regular quartz veins to be described, although the feldspar that mostly constitutes this rock is very acidic or high in the percentage of silica. Prospectors find this country very difficult to explore on account of its being densely covered with heavy timber and thick underbrush, especially near the coast, so that it is only by pushing up along the streams that they have picked up the clues that have led to many of the locations now made. Where so little development work has been done and so little of the ore really tested it is next to impossible for any one to reach a safe conclusion as to the value and extent of the ore now exposed, and all interested in Alberni are awaiting the results to be determined by more underground work, the milling tests soon to be possible on the erection by Mr. James Dunsmuir of the prospecting stamp mill at the foot of Mineral Creek and the first clean-up on the placers where hydraulicing is being inaugurated.

In reference to fire assays of nearly all kinds of free-gold ores I would like to express my belief that such—as it is almost impossible to get average samples—are practically of but little value except in indicating whether gold is present or not, and of none at all in determining the probable *yield* value of an ore unless very careful average samples be taken from a large amount of ore, which is seldom done except by thoroughly experienced men. It is also utter folly by picking out a piece of rock, probably one looking very promising, to attempt to arrive at the value of an ore by the assay value of this particular bit, or further still by the common but pernicious and erroneous method of *averaging* up a number of such assays.

One must not forget that there is often a big gap between the *assay* value and the *yield* value of a gold ore, and that every caution must be taken to determine the milling qualities of such an ore, hence in nearly all gold camps of note where free gold occurs in the ore fire assays are seldom made and mill runs are imperative, and here again the lots of ore chosen must not be picked but systematically sampled out so as to give an average, representative as far as possible of the general run of the mine, keeping always in mind that ore near or at the surface, enriched by decomposition of the vein matter, is often of high value and easier to treat than ore from a lower horizon in the lode or below the natural drainage level.

The drift of these few remarks is to the effect that in this yet untried mining district there are needed much more work to ascertain the size and character of the ore bodies, and also many careful mill tests, prosecuted with intelligence and experience, to decide not only the value of the ore but its treatment qualities, and much can be done along these lines without an excessive outlay of capital, thorough experience indeed being almost more requisite than money.

It is to be hoped that the tests soon to be begun will be carried out with experience and understanding, and that the results will be so encouraging as to lead to vigorous mining operations. I believe that with careful, systematic prospecting and exploratory work, work honestly intended to prove and develop the true value of a claim but *not* intended for purely speculative purposes, the work of an intelligent miner not of a projector of mining schemes, this district may become the centre of mining activity; but what is to be most deprecated is the issuing of extravagant reports that, on the face of them, are absurd, for such invariably redound to the hurt, discredit and retarding of what may be a most promising region. A few may make some small gains by such practices, but everybody interested in the opening up and advancement of a new locality should strive to suppress such ultra-highly coloured statements as most injurious to their own real interests, and endeavour by actual development work to prove up their property, as one really promising claim thus developed will be of more substantial value to a district than a vast deal of puffing that cannot bear out investigation.

I will give a short description of properties and localities in the order I visited them. All altitudes were measured from sea level by a pocket aneroid and bearings are magnetic.

BARCLAY SOUND.

Sarita River.

About a mile up this river on the left bank is a steep bluff of diorite, heavily covered with timber and under-brush, showing a considerable amount of rock more or less permeated with magnetite, iron and copper pyrites and pyrrhotite, which in places where a few shots had been put in showed in solid masses of basic sulphides. As to the extent of this deposit no definite idea can yet be formed until some work is done, and the men engaged building a house were to begin driving a tunnel above high water mark to exploit this large surface exposure.

This claim, called the "Sarita," is said to be located in the Indian Reserve, the foreman being John Gray.

Through inability to find the trails I had to abandon a visit to a deposit of magnetite near here, and the marble reported as near Poett Nook.

Santa Maria Island,

Near the south end, just at high water mark, is a shaft filled with water, whence many years ago iron ore was extracted, the shaft having been sunk on a small exposure of magnetite containing sulphides, running across this end of the island.

Copper Island.

"Rainbow" claim. On a small neck of land on east side of this island, near a good sheltered anchorage, a shaft has been sunk 50 or 60 feet on a ledge of magnetite that carries more or less sulphides. This ledge out-crops irregularly along the shore, some parts very red or reddish brown proving on fracture to be solid pyrites. There is a good house near the shaft, but all the men had been removed to the Sarita River property.

Along the north end of the island, and along the shores of the adjacent mainland and islands, is seen much limestone of a dark colour and hard fine grain, traversed by many dykes of eruptive rock, by which all bedding planes have been nearly obliterated. No fossils were found.

Sechart.

On this peninsula much prospecting has been done by Mr. Anderson, who has built good trails to different points, and has disclosed by stripping several large exposures of iron ore. The first claim visited was the "Lord of the Isles," altitude about 950 feet, where three men were engaged uncovering a small exposure of magnetite that lies in what appears to be diorite and next to a very extensive area of limestone, that at the point of contact with the eruptive rock is completely crystallized into large coarse crystals. On the "Crown Prince," 800 to 900 feet altitude, two miles from the wharf, or about ¾ of a mile from the nearest salt water, a large steep face on the mountain side has been stripped, disclosing much magnetite iron ore, in places in large masses separated by country rock, but no new faces exposed by blasting were seen. Mr. Anderson allowed me to copy the following analyses made on samples of ore.

(*a*.) By E. H. Cook, Cleveland Iron Works, Middlesborough, England: Iron, 66.0 per cent.; manganese, .11 per cent.; lime, 4.00 per cent.; sulphur, .02 per cent.; phosphorus, .01 per cent.; silica, 2.00 per cent.

(*b*.) By Dr. O Wurth, Pittsburg, Pa., U.S., October 19th, 1893: Iron, 64.01 to 66.32 per cent.; sulphur, traces to .09 per cent.; phosphorus, .007 to .009 per cent.

These analyses show a very small percentage of phosphorus; that would rank this ore as a fine Bessimer iron ore.

Other deposits of iron ore have been stripped, but I had not time to inspect them. These iron deposits can be easily mined and the ore brought down to a well sheltered deep water harbour, but as yet no work has been done underground to test the continuity or extent of these ore masses. Along the trails exposures of syenite and felsite were seen, and limestone was abundant.

The "Sechart" quicksilver claim, ½ of a mile up Pot-Hole Creek, which empties into the sea about ¼ of a mile from the wharf, has three tunnels and two shafts close to the creek in which it is reported native mercury was first found by hunters. The rock on the dump appears to be a diorite or a diabase, and some good specimens of the ore were found, which, on being broken, disclosed the cinnabar disposed along the extremely narrow invisible cracks, while decomposed rock was found carrying the metallic "quick."

The dense under-brush, but little cleared away, precluded further examination to learn in what relations the ore was to be found, but at one place where ore could be got a fault wall was seen to be next to this material. No work is being now done on this property, which is held under a Crown grant.

The "Hundred Islands" consist mostly of syenite, but in one place a bluff about 100 feet high, close to the water edge, was a hornblendic granite, from which had fallen many large blocks.

Effingham Inlet.

About 5 miles up this inlet is a high bluff of reddish brown eruptive rock of close, fine grained texture, but showing no series of regular cleavage planes, or indicating whether it would break out in large blocks. Associated with it were intrusions of greenish eruptive rock with more or less amygdaloidal structure, and fresh blocks of agglomerate were to be seen. There is deep water right up to the bluff, on which the cribbing for a wharf has been laid. Along the west side of the inlet at this point is exposed much limestone cut by dykes, but no rock of the true character of marble was seen along the shore, although good marble is claimed to be found inland.

ALBERNI CANAL.

Coleman Creek.

About a ¼ of a mile up this stream, on a claim located by Mr. McAllister for some Victoria gentlemen, on the surface of a bluff on the left bank, is evidence of a shear zone in the diorite, or where along a fault plane 6 to 7 feet of dark, rusty coloured crushed rock matter is seen, into which a tunnel was started and run 60 feet, where it branched into two short drifts, one 15 feet, the other 22 feet long. In the workings I could see no indications of a vein or of ore, although several smooth fault walls are there, with gouge or talcy matter along them. No work is being done on this property.

Granite Creek.

About 3¼ miles by a good trail from the mouth of Hiwatches Creek, on a tributary, or Granite Creek, I visited the "Star of the West" claim, located 1894 by Messrs. McCoy, Poole, *et al.* Alt. 740 feet. A tunnel then about 50 feet long was being run N. 15° E., following as a hanging wall, a well-defined fault wall, dip S. 15° E. 60°, with another such or the foot wall, with 4 to 5 feet of greenish coloured rock between, carrying much calcite but little quartz, and some pyrites. Some of the rock called "blue quartz," tested with hydrochloric acid, proved to be lime. No assays or tests have been made of late, but from the material first taken out and on the dump, I was told assays of $10 to $12 had been several times obtained.

Several other claims have been located adjacent to this one, and also 7 or 8 miles up further along the creek, but as no one was at work further up, I did not visit them.

CHINA CREEK.

A road now runs from Alberni to the upper end of the "Duke of York" placer claim, whence 2½ miles more are being constructed to Mineral Creek, near its junction with China Creek, where, near De Beaux' cabin—Alt. about 1200 feet—the prospecting stamp mill will be erected for treating the test samples of ore from the property of the Alberni Consolidated Mining Co. and other claims up Mineral Creek, up and along which is a good trail, that I took and inspected the "Mountain Rose," "Last Chance," "Missing Link," "Alberni," and the "Chicago" claims.

"Mountain Rose."—Alt. 1500 feet. Owner, Wm. Campbell *et al.*, Alberni.

Two men were working stripping a well-defined vein, very irregular in width, of 5 to 30 inches of quartz, carrying a small amount of iron and copper pyrites, strike east and west, dip 80° N. into the mountain; country rock a greenish schistose rock, laminæ at right angles to course of vein, which is exposed for a short distance along the hillside but near the workings is faulted, the direction and amount of throw not having yet been determined.

"Last Chance."—Alt. 2125 feet.

The Quadra Mining Co. comprises three claims, the "Ophir," "Quadra," and "Last Chance," at the last of which two men were at work sinking a shaft, then about 30 feet deep. On the surface the shaft had been started in an exposure of very rusty iron-stained rock with a small stringer of white quartz, but the bottom of the shaft was all in country rock, a hard fine grained diorite of a slightly schistose character.

Foreman, John Merrifield, Alberni.

"Alberni."—Alt. 2800 feet.

The Alberni Consolidated Mining Co. own four claims in a block, the "Alberni," "Warspite," "Victoria," and "Chicago," the dispute as to ownership having been satisfactorily terminated admitting the commencement of progressive exploratory work, upon the results of which the further development of this locality now greatly depends. At the "Alberni" claim the last work was begun on the steep hillside on a clearly defined vein of quartz about 1½ feet wide, and an open cut nearly 20 feet deep was made before a shaft was sunk 40 feet down on the pitch of the hanging wall, but at the time of my visit this shaft was full to the collar with water, which, being too great to handle with a bucket, has necessitated the driving, 60 feet down the hill, of a tunnel, to be about 100 feet long, to tap the vein about underneath the shaft. At the top of the shaft the quartz vein was two feet wide, but following it along the surface a short distance it narrowed materially, while, down in the shaft, a miner stated that at it widest part it (*i. e.*, the quartz vein) was 3½ feet. The country rock on either side, eruptive rock evidently dioritic, is heavily impregnated with iron pyrites, and is reported to give good assays in gold, although this must be conclusively determined by the mill tests.

The dump, where most of the material from the shaft has been piled to be milled, consists mostly, as far as could be seen, of this pyritic wall rock with little typical quartz rock in evidence, hence increasing the importance that will be attached to the mill runs proving this rock to be good pay ore or not, as there is a large quantity of it; from a smaller quartz vein higher up the mountain on this claim, two tons of ore were selected and sent last year to an American smelter, from which most favourable returns in gold were obtained. A good cabin is near by the shaft. Strike of the vein being N. and S., dip 80° E.

Foreman, Capt. Ross.

The "Chicago" is the claim south of the "Alberni," and is about a line with the direction of the strike of the vein at the shaft just described, and about ⅛ of a mile distant. In an open cut about 30 feet long is a quartz vein 8 to 30 inches wide, strike N. 15° W. and S. 15° E., dip into mountain of 75° to 80° easterly.

The "Missing Link"—Alt. 3050 feet—immediately north of the "Alberni," shows, in a small open work on the side of a small creek, a quartz vein 1 to 2 feet wide, strike N. 30° W. and S. 30° E., dip about 80° easterly, with pyritic country rock.

From De Beaux to the "Alberni" shaft is about 1½ miles along the good pack trail, with a difference in elevation of 1600 to 1700 feet, and for testing purposes it will be easy to pack down ore to the stamp mill soon to be erected near De Beaux, and run by water taken from Mineral Creek, which will afford an ample supply for this purpose. It is strongly urged that this mill may be in charge of a man thoroughly experienced in gold-milling, capable of making fair sample lots of the ore at the mine and then of determining by use of the mill the probable average yield-value of the ore and the character of mill that may be best suited for this ore if such prove persistent in quantity and rich enough in gold to promise a good margin of profit, or otherwise these tests, so important in determining to a great extent the advisability of further expenditure, may be very unsatisfactory or worse than useless.

The "Golden Eagle," five or six miles above De Beaux by a trail along China Creek, is a kind of box canyon, in a steep mountain side scoured in places by annual snow slides, up which, along a ridge, a well defined quartz vein, in the same kind of country rock or diorite as described above, has been traced and explored by four short tunnels. The lowest tunnel, No. 1, was covered by the snow which never entirely leaves this basin, but Mr. Sutton reports its length to be 44 feet, with 7 feet of solid vein matter at the mouth and 3½ at the face. About 100 feet above is tunnel No 2—alt. 2,960 feet—which I was able to enter and find to be about 60 feet long and run in on a true fissure vein of quartz and iron pyrites, mispickle, etc., more or less banded in a direction parallel with the walls, 2½ feet wide at the mouth and 15 inches at the face. Strike west of south, dip nearly vertical.

Tunnel No. 3, altitude 3,075 feet, direction as No. 2, and nearly immediately above it. Vein, the same as below, but 3½ feet wide at entrance, but beginning to narrow at 35 feet in, until at the face or 45 feet only 4 inches wide; however, there is no reason to doubt but that the vein on continuing along its course may widen out again, as is characteristic of nearly every vein or ore deposit where such irregularities are to be expected. Tunnel No. 4 was inaccessible, and the approach for this examination to this property was attended with some difficulty, on account of the snow banks. No data as to the average value of the ore taken are available to me, but as I understand this claim has just been sold for a good price, we may expect that much more work will soon be undertaken and this vein thoroughly exploited.

PLACERS.

The properties of two companies were visited, where the work is being energetically pushed forward and will now be described. On the "Constance" claim I was informed that much water was giving trouble in the exploratory shaft being sunk to bed-rock.

The "Duke of York" claim; Superintendent, M. W. Leveridge, Alberni P. O.

The property consists of (*a*) the "Duke of York" and the "Queen" claims, 2 miles long, and (*b*) the "Prince of Wales" claim, below the Cataract Co.'s ground. On the "Duke of York" claim excellent work is being rapidly accomplished, in thoroughly and properly equipping it for work, all the requisite details to be completed before the water is turned on in the early part of July, after which the climatic conditions are such that hydraulicing may be carried on throughout the whole year, the cold winter spells being in most years very short and not at all severe.

Flume.—Near the upper end of the "Duke of York" claim is a dam across China Creek, whence water is led into a flume 6 feet wide, 3 feet deep, California pattern, for 1¼ miles to the pressure box, whence the pipe, 22 inches in diameter of No. 14 steel plates, imported rolled and punched, but rivetted on the claim, will carry it 1,100 feet to the pit, and then divide, with gates, into two 15-inch pipes leading to two 7-inch monitors. The grade of the flume is $\frac{8}{100}$ per 16 feet, and in one place is carried along a trestle work 60 feet high, and then, passing under an over-hanging bluff, is suspended by chains of ⅝-inch iron fastened to the outer end of sill while the inner end is bolted to a short piece resting on two bolts driven into the rock. Capacity of flume, 6,000 inches.

Head.—At the lower end of the claim, 240 feet head will be available, and for one mile up the stream nearly 200 feet, and with the two monitors it is expected 2,500 to 3,500 cubic yards of dirt will be handled daily with 5,000 inches of water.

Sluice Boxes.—At first in working the lower gravel sluices 6 feet by 40 inches, grade 6 to 8 inches per 16 feet, will be put in and lined with 9-inch fir blocks, but when working the upper benches and more dirt is available, the sluices will be 8 feet by 40 inches. There will be excellent facilities for an under-current 20 feet wide, grade 1 inch per foot.

It is proposed that in the season of low water the creek will be deflected through the flume and the bed of the creek hydrauliced through the smaller sluice, but with high water, then the benches will be washed into the larger, placed higher up.

Gravel.—Between 25 and 30 prospect pits have been sunk to bed-rock, in which the gravel is reported to have always prospected well. On either side of the stream are high benches of gravel, and as the claims are 10 chains, or ⅛ of a mile on each side, there is a large amount of ground to wash in which there is not an excessive number of boulders as might well be expected, and so far but few that will be beyond the capacity of the powerful derrick.

Dump.—Work will begin on bed-rock at the lowest limit of the claim, where the creek falls into a fast descending gorge that passes through 800 to 1,000 feet of territory not to be located as placer ground, and that should afford a site for a considerable amount of debris.

Derrick.—A very complete derrick, invented by Mr. Leveridge, Sr., will be put in the mine, by which stumps and all boulders up to 6 tons in weight will be easily lifted and dumped on the washed bed-rock, the stumps and heavier boulders to be lifted by chains, while smaller rocks will be rolled on to a 6 by 4-foot platform, it being intended to keep as many as possible of such boulders from entering the sluices. The derrick will be operated entirely by water-power through a 7-inch pipe, with gate from the main pipe and $1\frac{1}{8}$-inch nozzle, on a hurdy-gurdy water-wheel centered horizontally up on the gudgeon of the mast, below a platform. The mast is 86 feet long, 16 inches square at the butt and 14 inches at the top. The boom will be an extensor one, capable of handling its load at 40-90 feet, this length to be at once changed at will with full load on, so that a stump or big boulder can be easily moved 180 feet in 3 minutes, the derrick being operated by one man. This property will soon be fully and well equipped for the proper working of its gravel, and before long the returns from clean-ups should be on record. The timber was cut at their own mill, and houses, blacksmith-shops, stables, etc., are now erected.

The "Cataract"; Superintendent, J. J. Stuart, Alberni, P. O.

The property of this company comprises three claims, (1) the "Cataract," $1\frac{1}{2}$ miles long; (2) "Balley Hooley," $\frac{1}{2}$ mile; (3) the "Pal-Patlicant," $1\frac{1}{2}$ miles, on China Creek. About 1,000 feet below the lower end of the "Duke of York" claim is a dam 20 feet high, 48 feet along the crest, cost $2,000, the first dam higher up the stream having been swept away by a freshet. From the dam 5,000 feet of flume, 40 by 24 inches, grade not regular, carries the water to the pressure box, whence a 12-inch No. 12 steel pipe leads the water to a monitor with 4 and 6-inch nozzles with available head of 148 feet. At the time of my visit the monitor was being used to prospect a high gravel bench on the right bank, and a face about 30 feet high was exposed, but so far no holes have been got down to bed-rock. 200 feet of sluice-boxes, 4 feet by 3 feet, grade $\frac{1}{2}$ inch to the foot, were carrying away the dirt, but as the creek has but a small drop along this part of the claim, the sluice could not be put in with a steeper grade or so as to reach bed-rock until run a considerable distance up stream. No mercury is being yet used in the sluice, but if this prospecting gives favourable results it is proposed to run a new and larger flume, by trestling which 40 or 50 feet more head can be got, and to install a complete hydraulic plant, derricks, etc.

There is much gravel in the benches on both sides of the creek, carrying gold, it is claimed, in nearly every part, and in the pit not many boulders have been encountered. On both properties can be seen the places in which, for several years, the Chinamen worked in their primitive way.

Being under orders to proceed without delay to the Kootenay Mining District, I regret that more time was not at my disposal to make a further and more extended examination in this part of the Province, but with more development done and more definite results attained, I hope on my next visit to find much progress to report and successful mining properties in full operation.

I have the honour to be,
Sir,
Your obedient servant,
WILLIAM A. CARLYLE,
Provincial Mineralogist.

Bureau of Mines,
Victoria, B. C.,
June 17th, 1896.

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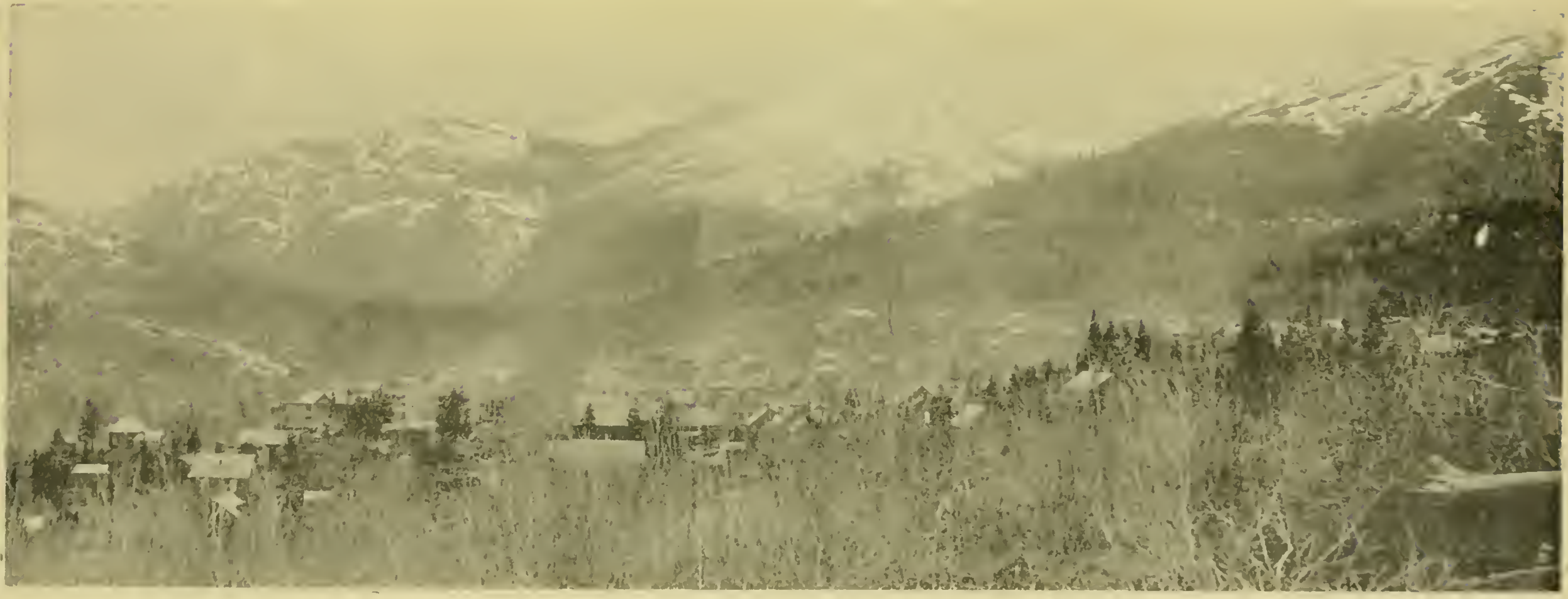

ROSSLAND, MAY, 1896.

REPORT

ON THE

TRAIL CREEK MINING DISTRICT

BY

WILLIAM A. CARLYLE,

PROVINCIAL MINERALOGIST.

BULLETIN No. 2.

The Provincial Bureau of Mines,
Victoria, B. C., August, 1896.

By Authority.
JAMES BAKER,
Minister of Mines.

REPORT

To the Hon. Col. James Baker,
Minister of Mines, British Columbia.

Sir,—In presenting my report on the Trail Creek Mining District, West Kootenay, I first wish to acknowledge my keen appreciation of the invariable courtesy and assistance tendered me by the mine owners, mine managers, and the other gentlemen connected with this industry, who spared no pains in giving me all access to their properties, and all information relating to the history and conditions of the mines, and the exact amount of the output of ore to date. In this report it will be necessary to go over much ground quite familiar to those conversant with the district, but many of these details may be of service and interest to those outside whose attention has been directed to the fast developing mineral resources of this Province, while it is desirable that as much information as possible be placed on record in the reports of the Bureau of Mines, that may be supplemented from time to time as work steadily progresses, without undue repetition. The work it is proposed to be undertaken by this Bureau is rendered much more difficult by the great area of this Province, and also by the fact that it will be in great part the pioneer endeavour to investigate and record officially the greatly differing conditions that obtain in the many new mining camps that are now being founded. Excellent work has been, and is being, done in the West by the Geological Survey of Canada, but this work is only fairly begun, and it is to be hoped that Dr. Dawson, whose labours have been of such signal value in the West, will be able to extend at once the operations of his Department in British Columbia, especially in this district, as the inestimable value of a thorough geological survey of a country in which ore deposits are to be found has been well established by the results obtained in the Western States of America, where these surveys have proved most useful and beneficial in a strictly practical sense, not only to scientific men, but to the prospectors and explorers who have thus been guided.

Perhaps the greatest factor that will determine the progress of mining and the realization of the wealth that undoubtedly is now locked up in these mountains, is the means of communication and transport. The ores must be carried to the metallurgical centres for treatment, and if the ore deposits now known to exist, and those that may yet be discovered, are to be made available and to become a most valuable part of our resources, trails, roads and railroads must be constructed to make possible the concentration of ores, fuels and supplies at the most favourable points; and if this part of the industry is to be retained in Canada, Canada must assist in boldly advancing these means of communication to make easily accessible the coal-fields and the mines from which the different classes of ore can be obtained, that separately are difficult to treat, but brought together and intermixed, can be reduced at minimum smelter charges. Favoured by the trend of the mountains and valleys, American railroads are rapidly entering from the south to transport Kootenay ores to the American smelters; but, notwithstanding much greater difficulties of construction, Canadian roads must be energetically built, and, not only will more mines be opened up, but the large reduction works with the large employment of capital and labour will be mostly retained within this Province. The opening up of Kootenay during the last six or seven years has been rapid, but the most marked advance has followed the building of the various lines of connection already completed, as is seen, for one instance, in the rise of the new camp of Rossland, but more rapid advance is awaiting these better facilities, which it is safe to predict will be called on to carry a heavy tonnage. Several important lines are seeking aid to be built; lines that will open country that already is proving most promising as it is further prospected, and it is hoped that this aid will be granted, so as to permit the immediate commencement of these important undertakings. Not only is the bulk of this ore being shipped to the south, but the large proportion of the fast increasing demand for mine and mercantile supplies is being satisfied by the cities on the other side of the border, with the result that a great revival in their business affairs has followed the opening up of these good markets in British Columbia, greatly due to the fact that orders can be now more promptly filled and forwarded from this source, this advantage more than counterbalancing the customs duties that are imposed upon imports. Not only this, but much of the mining machinery manufactured in Eastern Canada, and now being extensively ordered, is being brought most of the way over American railroads to the point of entry, Northport. If our own centres of trade are to benefit by this growing business, strong efforts must be made to get these facilities for rapid and prompt delivery which, with customs dues, will more than give Canadian business concerns the advantage, as the fact should be realized that new and large markets are opening up in British Columbia. American business men are making strong efforts to secure this trade, and the current once set in, it will be difficult to deflect it into that channel most beneficial to the commercial interests of this country.

Bulletin No. 2 has been written during a few weeks examination of all the mines and many of the claims yet ranked as prospects, in the immediate vicinity of Rossland. This district has been constantly growing from a small number of claims located on the hill on which the now famous mines are working, until, as work has uncovered a system of parallel veins or leads, in many of which the indications of finding ore are excellent, this area now extends three or four miles east and west of this centre, and one to two miles north and south. To the west, and also to the east across the Columbia River, most favourable reports concerning the discoveries of ore similar to that of Rossland are being made by prospectors and others who have examined these new localities, and, if time will permit, some of these will be visited and described in the Annual Report of the Minister of Mines.

The discovery, during the last two or three years, of large bodies of high grade gold ores, in which dividend-paying mines are now being operated, is attracting the earnest attention of many mining men and capitalists of both America and Europe. The opening up of the large mines at Rossland that, notwithstanding many heavy disadvantages—rapidly being overcome, such as means and cost of transportation—have proved very remunerative, and, as more extensive exploratory work and greater depth are attained, promise permanency of large and profitable ore bodies, is stimulating more thorough prospecting not only around Rossland, but in many other localities in this district, with the result that other camps are quickly coming to the front as good prospects on being worked disclose ore of increasing value.

Many claims at many points in Trail Creek District are now being carefully examined and bonded or bought, which better means of access and egress, now projected or being completed, will render possible their being worked, and the principals or agents representing capital are investigating these new resources. The fact that men interested in the treatment of ores, or their transportation, on studying the conditions and possibilities now shown, have begun large undertakings, or are now planning them, is indicative that the future development of this part of the Province will be soon on an extensive scale, and of their confidence, based on experience, in the extent and value of its mineral wealth.

The concensus of opinion of many mining men who have studied the conditions and surface showings in this new camp at Rossland, is to the effect that few camps have ever shown so many favourable indications that warrant the belief that on further extensive, systematic exploration other shutes of gold ore will be uncovered. Prospecting has disclosed these many parallel veins, varying in width, when exposed, from an inch to several feet, and it is believed that many more ore shutes will be found when these most promising surface indications are thoroughly exploited, for it is quite improbable that the large shutes of rich ore that have been shown on the surface by denudation will be found to be the only ones.

This district has now reached that stage when persistent, plucky development work, sustained by ample capital, must be done to prove up these many veins and surface showings, but a sufficient amount of working capital is demanded, (*a.*) because much of the rock is very hard to mine, necessitating good machinery to make proper progress, (*b.*) considerable or even extensive development work must be done in the search for more pay shutes, (c.) while the more or less faulted nature of the ground, though not serious, will complicate this work. While the present mines were opened up with comparatively small capital by reason of the mines producing pay ore shortly after work was begun, or ore that was very profitable as soon as roads were built over which it could be sent to the smelters, still any enterprise that is now undertaken will require strong financial support, and already several powerful companies are at work.

The output from Rossland this year will not show the predicted increase over that of last year for several satisfactory reasons, although there is now, without doubt, much high grade ore in sight. In the first place better and cheaper means of transport for ore are being awaited, as the shipping mines are now in such a position that they can afford to hold back their shipments for better rates. Again, the smelter at Trail has not until recently been in such working order as to be able to handle anywhere near the amount of ore it is proposed to treat, nor has the tramway yet the proper facilities for carrying away much ore, but both of these, in a short time, should be able to work up to a much greater capacity. In some cases shipments have been suspended on account of the properties being bonded, or until the completion of underground workings that will make mining more advantageous.

The camp is the scene of constantly growing activity. Much good exploring work has been begun, much more is being projected. Already five air compressor plants are installed, and six more are being put in, while larger hoisting engines and pumps have also been bought, most of this machinery being of Canadian make, *i.e.*, the Ingersoll-Sargeant Drill Co., Montreal, the Rand Drill Co., Sherbrooke, Quebec, and the Jenckes Machine Co., of the same place. Altogether, $175,000 worth of machinery and supplies have been ordered for this camp.

Production.

Total No. of tons smelted to July 1st, 1896	27,085
do. " ounces of gold	45,234
do. " " silver	67,793
do. " lbs. of copper	1,265,362
do. gross value recovered by smelters	$1,007,007

Average net values per ton—gold, 1.67 oz.; silver, 2.5 oz.; copper, 2.3 . Value, $37.18.

In the above returns the compilation was made directly from the shipping returns and books most kindly produced for inspection by the officers of the following mines that have shipped ore other than test lots: The Le Roi, War Eagle, Iron Mask, Poorman, Josie, Cliff, and Evening Star, and the above results give almost the exact output of the mines at Rossland up to July 1st, 1896. The tonnage is the net, or with moisture deducted amounting to ½ to 1 per cent. The amount of gold and silver given is the actual amount allowed for by the smelters, or 95 to 98 per cent. of the assay value of the gold contents, and 95 per cent. of the silver. The percentage of copper given is the assay value less 1.3, as in the general average value the copper assay would indicate 3.6 per cent. of copper in the ore. The gross value includes smelter and freight charges. The output from the free-milling ores of the O. K. mine could not be obtained in time for this bulletin.

Total amount of dividends paid to July 1st, 1896		$332,500
Le Roi	$175,000	
War Eagle	157,500	

Location.

The Trail Creek mining district is located in the southern part of West Kootenay, on both sides of the Columbia River, and along the International Boundary Line between Canada and the United States.

ROSSLAND,

The chief mining centre, has grown very rapidly to a town of about 4,000 people, and is supplied with good hotels, two banks—the Bank of Montreal and the Bank of British North America—churches, stores, a water-works system, electric light plant, three newspaper offices, post office, express office, etc , and is noted for the orderliness maintained by the Government officer, Mr. John Kirkup, and his subordinates, many of the chief elements of disorder usually found in a new mining camp being vigorously suppressed. The town is about six miles west of the Columbia River, on the north slope of the valley down which runs Trail Creek to the Columbia, at which junction is the town of Trail, and close to its northern boundary are the principal mines on the slopes that lead up to Red Mountain, Monte Cristo Mountain, and the Columbia-and Kootenay Mountain, that rise gradually from 800 to 1,800 feet above the town ; to the south is Lake Mountain, which, with Look-Out Mountain near Trail, comprises the South Belt, and to the west is Deer Park Mountain. One mile and a quarter to the west is a small stream, the east fork of Sheep Creek, flowing southerly and joining the Columbia at Little Dalles beyond the boundary line about four miles distant.

Communication and Transportation.

Four years ago only trails led into this part, the Dewdney trail having been built in 1865, but now a waggon road runs to Trail and another down the fork of Sheep Creek to Northport, in the State of Washington, over which much ore has been and is shipped in heavy ore waggons, which return with much of the supplies for the town and the mines. Already three lines of railroad are surveyed to this town, one of which is built and another is building, while it is reported that one of the great American roads in the north is looking for a line of entrance. Of the three lines surveyed, one, (*a*) the Columbia and Western Railroad, has built a narrow gauge line, locally known as the "tramway," easily alterable to standard gauge, down Trail Creek to Trail, to carry ores to the Trail smelter or elsewhere, and connection is made with the excellent steamers of the Columbia and Kootenay Navigation Company, that run north 130 miles, connecting with the main trans-continental line of the Canadian Pacific Railroad at Revelstoke, or at Arrowhead, and the railroads at Robson and Nakusp, that run to Nelson and the Slocan respectively, and to the south to Lytton and Northport, 25 miles. This C. & W. R. R., running 11¼ miles to overcome the difference in elevation between Trail and Rossland, of about 2,100 feet, using several switch-backs, is now being located westward to the Boundary District and thence on to Penticton on Okanagan Lake.

(*b*.) The Canadian Pacific Railroad has a line surveyed in from Robson, which is expected will be constructed as soon as possible, and extended west to tap the main line, and eastward to the main line, passing by the way of the Crow's Nest Pass, where are located the great deposits of coal that will yet become a strong factor in the smelting propositions of the Province. (*c*.) The Spokane Falls and Northern Railroad, also known as the Red Mountain Railroad, President, D. C. Corbin, now being built from Northport up the east fork of Sheep Creek, will pass, as does the tramway, in close proximity to many of the leading mines, and will connect at Spokane with the two trunk lines, the Northern Pacific Railroad and the Great Northern Railroad, whence is direct communication with all parts of the United States, as well as easy access to the smelters on Puget Sound, at Tacoma and Everett, to those at Helena and Great Falls, Montana, and to the smelters farther south in Colorado and at Kansas City. Hence the fast developing scheme of transportation will soon change the conditions of this district by giving cheaper and quicker egress for the production of the mines, or for the assembling at the most favourable points at the smelting or other reduction works, the different kinds and grades of ores, the fuels, fluxes and other supplies that should make possible the much cheaper handling and treatment of the various ores now known to exist in large quantities.

Although much ore of high grade is being mined, large bodies of low grade, averaging $4 to $12 in gold, 1 to 3 ounces in silver and up to 3 per cent. copper, are now exposed, and further necessary systematic and fearless development work must be done, which this widening range of transport facilities will aid most materially not only in handling the output of this one camp, but in collecting at the best points different classes of ores from the newer localities now being prospected, as well as the camps already established elsewhere in this part of the Province. The restriction to the more or less same class of ore, unless it be of a most favourable character, seldom got or maintained, is generally not at all conducive to the best smelting practice, and the localizing of the smelting industry of the Province at the most advantageous centres where will be collected the different ores from different parts that are so necessary for the most economical treatment, one kind of ore helping to flux the others, will be greatly determined by the shipping facilities by waggon road, railroad or steamboat, that are now being supplied or projected. As the future of the mining business in Rossland and the surrounding districts will be largely dependent upon the cheapest treatment of the ores produced, and we can now announce the erection in the near future of very extensive smelting plants in the Province, communication assumes vital importance, and now it is almost promised that it will be rapidly extended as the ore bodies are found to be persistent and profitable throughout more than a limited area.

The mountains in this Trail Creek region are for the most part rounded and covered with timber, not very high and not precipitous, so that a waggon road can usually be built anywhere without much difficulty, while a railroad can be put through any of the different valleys with switch-backs if needs be, so that nearly any mine will not be difficult of access. The supply of timber for fuel and mining purposes on most of the claims will soon be exhausted, but much can be brought in cheaply by the railroads when the need comes. The supply of water is also small, but so far adequate for mining purposes, and a large supply cannot be got less than 6 miles distant.

Early History.

Early in the sixties the placer mines on Wild Horse, Findlay, and other creeks in East Kootenay, having been discovered, resulting in the rush there of miners, and the constant demand for supplies, as there was no means of communication between the coast and this district, except through the United States, with vexatious delays at the Customs, Mr. E. Dewdney, now the Hon the Lieutenant Governor of British Columbia, was instructed to survey and construct a trail entirely within British territory, through the southern part of the Province, as a passage to the north had been proved to be not feasible. In 1865 this trail, since known as the Dewdney Trail, was finished, and in its course it passed about one mile south of the present town of Rossland on its way down Trail Creek to the Columbia River. Hence a means of ingress was given to this region, and indications show that early prospectors were attracted to the iron-stained cappings that have now attained such importance and value, as a 5-foot hole on the Le Roi, and other openings testify, but the low grade surface rock discouraged them, while the means of getting such ore to smelting centres seemed quite out of reach. However, in 1889, Joseph Bourjouis located the first claim, the Lily May, near the Dewdney Trail, which in 1890 was recorded by J. Bordau. In this year J. Bourjouis located the Centre Star and the War Eagle, while the Virginia and Idaho were staked by J. Morris, his partner. They also discovered the Le Roi but forbidden by law to stake more than one claim on the same vein, this piece of ground became the property of Mr. E. S. Topping by his simply paying the expense of recording.

In November, 1890, Mr. Topping met at Colville two Spokane attorneys, Mr. George Foster and Col. Wm. Redpath, showed them samples of Le Roi ore, and offered to sell one-half interest in the claim for $30,000. These gentlemen became interested in this property, went to Mr. Oliver Durant, a gentleman of long mining experience in the west, in whose judgment they had full confidence, and he, also impressed with the ore, finally secured a working bond on $\frac{16}{30}$ of the property for 6 months, with the proviso that during that time he should spend $3,000 on the claim. Although he knew good mining men had condemned the ore deposits of this region as of altogether too low a grade, Mr. Durant came up at once, examined the claim, taking from a shallow cut 16 feet long across solid sulphides careful samples that returned as high as $60 in gold, at the same time visiting the Enterprise, Centre Star, Idaho, Virginia, War Eagle, and Josie. Satisfied with the showings, E. J. Kelly was left in charge of the sinking of a shaft, from which during the winter weekly samples were forwarded, with great difficulty, to Marcus, Wash., by trail down Trail Creek and the Columbia, samples that assayed from traces of gold up to $472. In the spring of 1891, after many vicissitudes, 10 tons of picked, pure sulphide ore from the bottom of the 35-foot shaft, where the vein was fully 9 feet wide, were packed out to the Columbia and shipped to the Colorado smelting works at Butte, when the excellent return of $84.40 per ton was given as the value of the ore, or 3 ounces of silver per ton, 5.21 per cent. copper, and about 4 ounces of gold. The bond was then taken up, and in the course of time the remaining $\frac{14}{30}$ were sold by Mr. Topping to some of the present owners. The Le Roi Gold Mining Company was then formed, and about 70,000 shares of the treasury stock sold at a small figure.

For over a year Mr. Durant had charge of the work, contending with many obstacles, insisting on the continuance of development as he pertinaciously believed in the ultimate conversion of this prospect into a valuable mine, but finally he decided to sell out his interest to the others, and with Mr. A. Tarbet bought the Centre Star and Idaho, upon which nearly 900 feet of work were done at a cost of $25,000, work that was the main support of this little camp. But the need of roads was pressing, no advance could possibly be made, and again through the efforts of Mr. Durant, a trail and then a road were built up the East Fork of Sheep Creek from Northport by the business people of that place, and Captain Fitzstubbs, Gold Commissioner for West Kootenay, ordering the construction of a road up Trail Creek from the Columbia, the conditions of the camp were at once made much more favourable. With the coming of the financial crisis of 1893, Mr. Durant, whose unceasing and determined efforts had overcome many difficulties and disappointments, and demonstrated that the properties he had so faithfully worked at, were good, was forced to suspend operations until 1895, when he resumed work on the Centre Star, now organized into a stock company.

In the winter of 1893-94, the Le Roi that had shut down upon the expenditure of the proceeds from the sale of the treasury stock, was able to ship by sleighs over the Trail Creek road, the ore that had accumulated upon the dump, and this netting a good profit, active mining operations were begun, and the fast increasing ore shipments, as detailed elsewhere, bringing handsome returns to those who had pluckily stuck to this claim, the Le Roi was fairly launched upon its successful career as a rich dividend paying mine. In the meanwhile, Mr. J. A. Finch and Mr. P. Clark had been attracted to the camp, Mr. Finch getting a bond on the War Eagle, which he relinquished after expending several thousands of dollars prospecting; after which, Mr. Clark, who had thrown up his bond on the Josie, obtained one on the War Eagle. In the work hitherto done on this property, a large shute of low grade pyrrhotite, averaging $14 to $16 in gold to the ton, had been more or less explored, but on going farther west a few hundred feet, by trenching, the top of a splendid body of good ore, averaging 2¼ ounces in gold, nearly 100 feet long and 8 to 12 feet wide, was uncovered, and this mine took its place among the best in the camp, paying shortly afterwards its first dividend, February 1st, 1895, of $32,500.

Another strong factor in the rapid progress of the camp is the connection with it of Mr. Heinze and Mr. D. C. Corbin, President of the Spokane Falls and Northern Railroad. Mr. Heinze, the head of a smelting works in Butte, Montana, sent in two men to go over the ground, with the result, after much negotiating, that he made a contract with the management of the Le Roi mine that they should supply him with 37,500 tons of ore on the dump, which he would pay for after the shipment and sampling of each lot, deducting $11 per ton for freight and treatment charges; and also 37,500 tons on which the charges should be at the lowest rates obtainable in the open market. With this amount of ore contracted for, a land grant from the Provincial Government and a bonus of $1 per ton smelted from the Dominion Government, Mr. Heinze erected the Trail Smelter and built the tramway from the smelter to the mine. Mr. Corbin who has extended his road from Northport to Nelson, supplied also with a Provincial charter and land grant, is pushing his road up Sheep Creek from the south to Rossland. Thus constantly as the conditions improve whereby the cost of mining, shipping and treating the ore are materially lessened, does the limit decrease at which the ore ceases to be profitable and much more of the lower grade ore now in sight is made available.

The Ore Deposits.

Mr. R. G. McConnell, of the Geological Survey of Canada, after a short visit in 1894, reported* the country about Rossland to be "an area of eruptive rock, mostly diorite and uralite porphyrite cut by many dykes," but as no complete geological survey has yet been made, nor any reported lithological study, only a very general description can now be attempted. The main mass of all the country rock is evidently diorite, although it presents many different gradations in composition and structure, varying from a fine grained aphanitic rock with very little horneblende at one extreme to nearly massive horneblende at the other, often showing mica and pyroxene. Much of it looks like a basic syenite and samples have been taken for microscopical examination and later report, but the main point of interest is the fact that these ore bodies or veins traverse the diorite, although cores from the hanging and foot walls of the Le Roi shute will be examined as well as samples from either side of the Centre Star ore shute so well defined in the cliff running up Centre Star Gulch, to ascertain whether these samples are all one class of rock or two. In going over this region the variations are seen to be very marked, in some places the rock being stratified as if of sedimentary origin, but in all probability a more or less altered eruptive. Porphyry dykes from one foot up to 60 and 80 feet wide traverse the country, many with a north and south strike, but with no apparent dislocation of the veins which they cut through; indeed, at six such points of intersection the ore seemed to be concentrated, and even to follow along the dyke for some distance, but this must be made clear by further under-ground work. A careful geological survey will reveal very interesting facts relative to the formation of these ore deposits.

In this Rossland ore, much prospect work has shown clearly that there is a large system of lines of fracture with an east by west and north-east by south-west trend, and a persistent northerly dip, along which more or less ore has concentrated, either as bodies of solid sulphides or sulphides scattered through the country rock. Some of these fissures can apparently be traced through several 1,500-foot claims, and along them are the large ore shutes now being mined or developed, the maximum width of pay ore so far being about 35 feet, and maximum length 310 feet. Many of these fissures have been or are now being prospected, and in many instances with surface indications of the most unfavourable character, the improvement has been very marked in the increase of the amount of ore and its value, and the great probability that more rich ore shutes will be found by following these fissures has made all such property valuable, and is deciding the commencement of extensive exploratory work. Again, large shutes of low grade ore, mostly the coarse grained magnetic iron pyrites or pyrrhotite, assaying from traces to $6 to $8 in gold, have been found and are being explored for better grade ore and so far with some success, but development, except on a few claims, has hardly yet begun and so far only the shutes that have been exposed at the surface are being worked, and it is yet impossible to foretell how much extensive underground mining will be rewarded. Further details as to the ore bodies will be given in the description below of some of the mines.

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*Summary reports of the Geological Survey of Canada for 1894, 1895.

The surface of these ore shutes is covered with the typical iron capping, or reddish brown sintery mass, and experience enables the prospector to distinguish between disintegrating sulphides, and barren diorite heavily iron stained by the oxidizing of the bisilicates or the iron pyrites nearly always present in this rock. Although it is difficult to prospect such rock which may be much iron stained but with no vein whatever in the vicinity, nearly all work is done along one wall and the ore appears to follow along one wall, where the rock is not too full of fissures that disguise true conditions, but it is doubtful if more than one wall ever really exists, although a parallelism of lines of fracture may for a short distance seem to prove the contrary. Wherever the ore is found to consist almost of pure sulphides, it will be found lying along and parallel to such a wall, after which ore is disseminated more or less through the inclosing rock, often following along small fissures that in some cases form small veins of good ore that run for a considerable distance away from the main deposit. In all the mines the ground is faulted, thus dislocating the ore deposits and stringers and complicating the search; but these slips will be better understood as work progresses, although much development work will have to be done by driving steadily ahead along the general course of the veins and cross-cutting, for the good rule of following the ore is seldom possible for any distance by reason of these dislocations.

The Ores.

The ores at Rossland, with the exceptional free-milling gold quartz of the O. K. mine, may be divided into three classes:—

(*a.*) Those large deposits of coarse-grained massive pyrrhotite, locally known as the "iron ore," in which very little or no value in gold is carried.

(*b.*) The ore found in many claims on the south belt, as the Lily May, Homestake, Mayflower, Curlew, Gopher, R. E. Lee, etc., in which the sulphides are not pyrrhotite but iron pyrites and marcasite (white iron), with in some of these mines much arsenopyrite, and also zinc blende and even galena, in which case the silver value exceeds the gold, and the percentage of copper is very small or nothing.

(*c.*) The typical ore of the camp as sold by the Le Roi, War Eagle, Iron Mask, or Josie, is divided into first-class and second-class. The first-class consists of nearly massive fine grained pyrrhotite and copper pyrites, sometimes with a little magnetite, or mispickel, with more or less quartz and calcite. In this class of ore, as got from the lowest workings of the Le Roi, the amount of quartz is much higher, the smelter returns giving 11 to 52.8 % silica, and 20.6 to 26.8 % FeO., but this is proving the best ore in the mine, the average smelter returns were on 1,200 tons, 2.6 oz. of gold, 1.8 oz of silver, and 2.5 % of copper, or $53.05* net, per ton, while some shipments went as high as 4.06 oz. in gold.

The second-class ore, and the bulk of the ore of the camp shipped, will be most probably of this character and value, is a diorite with a comparatively small percentage of these sulphides, but the value is still very good; 1,800 tons of the Le Roi, second class, yielded by smelter returns, an average of 1.34 oz. of gold, 1.4 oz. of silver, and 1.6 % copper, or $27.97* net, per ton. Mr. Bellinger, of the Trail Smelter, kindly gave the average analysis of this ore to be FeO. 22 %, SiO_2 42.5 %, CaO. 7. %, MgO. 3. %, Al_2O_3 18. %; copper, 1.5 %, S. 6 %.

Treatment.

The destiny of the mining operations of this part of the Province will depend, to a very great extent, upon the means of transportation, and then upon the cost of metallurgical treatment, for a large amount of low grade ore is promised, and the possibility of treating such ores at a low figure to leave a fair margin of profit must attract the best endeavours of the metallurgist. The ores containing a high percentage of sulphides will be very desirable, and should command the lowest smelting charges, but in all probability the great bulk of the Trail Creek ores will be of the mixed class, or diorite with a comparatively small proportion of sulphides, and hence a low percentage of copper, while again the amount of arsenic, abundant in some of the ore, will be an important element. This ore has now been shipped to many of the American smelters, such as at Tacoma and Everett, Washington, and Great Falls, West Helena, and Butte, Montana, and now much will be smelted at the new works at Trail, to be described. The erection of smelters at Rossland in the immediate vicinity of the mines, is being seriously contemplated, but it is yet too early to make any definite statement. The cost of freight and treatment is now about $10 to $14 per ton, when 95 per cent. of the assay value of the gold and silver is paid for, and 1.3 is deducted from the percentage of copper present.

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* Not deducting freight and treatment charges.

Of course the possibility of other processes being suitable to such ores is being tested, such as the cyanide and chlorination processes, and the results will be awaited with much interest as some such process may prove very successful, and all judgments should be deferred until the conclusive experiments have been completed.

The British Columbia Smelting and Refining Company.

The officers of this smelter, which is located at Trail Creek, B.C., are:—President, F. A. Heinze; Commercial Manager, J. F. Lansing; Superintendent, E. H. Wedekind; General Superintendent of Mr. Heinze's Smelters at Butte and Trail, H. C. Bellinger. On securing the large contracts for ore from the Le Roi mines, Mr. Heinze secured the present excellent smelter site, on the bluff overlooking the Columbia, at the mouth of Trail Creek where has sprung up the town of Trail. This smelter has been erected with great rapidity in spite of inclement winter weather and great difficulty in securing supplies of building material and importing the plant and machinery: but although work was begun October 10th, 1895, the first furnace was fired up in February, 1896, and now five furnaces are in full operation, with further extensive and important additions being rapidly pushed to completion, additions that should greatly improve present conditions and treble the capacity of the works. Beside that with the Le Roi, contracts have been made with the War Eagle, Iron Mask and Crown Point. Mr. Heinze and his associates are proving their ability for prompt decisive action, not only in the construction of their smelting works and the tramway, but in the inception and inauguration of other extensive enterprises that mean much for the improvement and advance of the mining operations of this district.

As was to be expected the ores from this new camp have offered at first some considerable difficulty in treatment, especially as the class of ore now mined is much more siliceous, and contains less copper than the earlier tests indicated, but now every furnace is working with much less trouble and up to their capacity, especially since the floods have subsided permitting the more regular supply of coal, and the smelter is now the scene of activity where, ten months ago, were only the sand bluffs of the Columbia.

The smelter now comprises:—

The Sampling Mill, daily capacity, 150 to 200 tons: bin capacity in the mill, 750 tons. The ore passing through a 12x22 inch Blake crusher, is run through a trommel, whence the fines go to a Constant cylindrical sampler, and the over-size to a 9x15 crusher and rolls, and then to the sampler and into the bins, until the lot of ore is settled, from whence it goes to the calciners or the bins from which it can be drawn in cars to the blast furnace. This sampler is inadequate for the amount of ore offered, and is now being enlarged so as to handle 350 to 400 tons per 24 hours.

In the *Roast House* is one O'Hara automatic calcining furnace, with foundations laid for a second. This furnace is 120 feet long over all, and has two 90-foot hearths, one above the other, 9 feet wide. One travelling chain passes along the centre of the hearths, carrying 6 plows and 6 trolleys or chain carriages, at the rate of about 25 to 35 feet per minute, and as yet very little repairs have been required, the chain, plows, and trolleys showing but little sign of corrosion in the furnace. Fifty tons of ore crushed to pass a half-inch ring are roasted per day, with a loss of 70 per cent. of sulphur contents, the ore taking 12 to 14 hours to pass throuph the furnaces in which ten fire places fired with wood supply the heat. Besides this furnace, there are in the furnace-room six circular calciners, such as used in Butte, placed above the reverberatories, the ore automatically fed, passing over 6 horizontal revolving hearths that discharge alternately from the rim and centre upon the lower one, thence into the hoppers below that are immediately over the hearth of the reverberatory. It is designed in this furnace that when once ignited no further fuel will be needed than the sulphur, but they must run continuously, and on account of irregularity, until recently, in the operation of the reverberatories, these calciners have not been used.

The dust chamber is 180 feet long, 10x12 feet inside, with wing walls from the sides every 10 feet, not over-lapping, but having a clear space through the chambers to the chimney, which is 140 feet high and 8½ feet square inside.

Furnace Room, 60x310 feet, 68 feet to peak of roof. The ore is being smelted after two methods:—(*a*.) In four reverberatories, hearths 14x22 feet, 40 tons each per 24 hours, in charges of roasted and unroasted ore, slag and limestone, are now being treated. The fuel is wood, but as this is not yet dry enough to give the required heat, coal also is being used, over 70 tons a day, from the Anthracite Coal Co.'s mines, on the eastern limits of the Rocky Mountains, whence it is brought over the Canadian Pacific Railroad to Revelstoke, or Arrowhead, and thence in scows down the Arrow Lakes and the Columbia to the smelter, whence it is raised up an incline 160 feet by a small steam hoist with cable and car, to a trestle along which the car can be run to the shutes wherever needed in the works.

(*b.*) In a 40-inch circular furnace, 12 feet high to feed floor, water jacketed, with six 3-inch tuyeres, also with fore-hearth, 45 to 55 tons of raw ore are now smelted in 24 hours. As the amount of sulphur in these ores is low, and that in the pyrrhotite not available for fuel, as already it is a natural matte, a typical form of pyritic smelting cannot be used, but more or less fuel is necessary, and a very satisfactory grade of coke is got from Fairhaven, Washington, although it carries from 20 to 24 per cent. ash. A small amount of limestone is added to the charge, but at present a very acidic slag, rather thick, but giving a good separation, is flowing, but very careful handling of the furnace is imperative. The analysis of this slag gives, SiO_2, 42 to 46 %; FeO., 12 to 19 %; Al_2O_3, 11 to 19 %; and MgO, 4 to 6 %.

A new 200-ton rectangular blast furnace, made by E. P. Allis & Co., Milwaukee, Wis., after a composite design by Mr. Bellinger and Mr. Wedekind, is being quickly erected. In this furnace, 120x38 inches at the tuyeres, the steel water-jackets will be 5½ feet high; height to feed door, 14 feet, with 14 6-inch tuyeres with thimbles of smaller size that can easily be put in for the purpose of experimenting with the quantity and pressure of blast, for all arrangements are to be such that tests can be made under varying conditions, to determine the greatest possible efficiency for this furnace upon this class of ore. Another feature of this furnace will be that, besides the movable fore-hearth, the bottom or crucible of the furnace will also be mounted, so that if required it can be altogether withdrawn from beneath the water-jackets.

The bluff on which the smelter stands is sand, but the top and face of the dump, 120 feet high, is being covered with slag that flows in sand gutters from the reverberatories, or is wheeled out in the usual slag-pots from the blast furnace; but in a short time all slag will run from the furnaces into water troughs, be granulated, and then swept out to the dump, which will be protected from scouring out by the slag covering.

In the engine room is a 65-horse power engine, with a 40-horse power engine now on the way. A No. 5 Root blower is now used, but a No. 7 will be needed when the big blast-furnace is blown in. Power is transmitted by shafting, but mostly by wire cables running over large pulleys to different parts of the works. However, steam power may soon be replaced by electricity, as a plant is to be erected at the foot of the dump and supplied with Pelton wheels and water under a 250-foot head. On a tributary of the Columbia, not far from Trail, a very large water power has been secured by Mr. Heinze, who proposes the installation of an electric plant for the distant transmission of electrical energy which may be brought to the mines, as electricity has now become so successful and economical a factor in mining elsewhere. At present 100 to 120 tons of ore per day are being brought down from Rossland by the Tramway, but this amount will be greatly increased. At the smelter 140 to 160 tons, it is stated by the management (July 29), are being smelted daily, with a concentration of about 20 tons into 1 ton of matte, which matte goes to Butte to be refined; but already the foundations for a refinery at the smelter are nearly completed, in which the matte, after being crushed, will be further calcined in a reverberatory to be constructed, and then re-smelted in two of the present reverberatories, after which the product will be treated so as to yield a high grade copper matte for export, from which 80 to 90 per cent. of the gold and silver value has been separated for special refining and parting at these works.

From 175 to 200 men are now employed, and when all these improvements are completed, this smelting plant will be well equipped and capable of handling 350 to 400 tons of ore daily; and if the demand increases, a still larger plant can easily be added. Again, with the increased means of transport, and the building of roads into other mineral producing districts, access to other classes of ore may greatly better and cheapen the process of smelting.

Description of Mining Claims.

A description of all the chief mines and many of the most promising prospects is now appended. In respect to titles, a Crown grant is the final deed from the Crown, granted on the completion of $500 worth of work, while a claim held as a location requires that its owners each have a free miner's licence and do $100 worth of work per year, or pay $100 into the

Provincial treasury. Many other properties than these it has been possible to examine in a limited time, are being actively prospected and will be inspected and reported upon another time. The properties first described will be those lying on the slopes of Red Mountain, Monte Cristo Mountain and Columbia-Kootenay Mountain.

LE ROI.

Area about 21 acres. Title, Crown grant location, on a hill rising on the south-east slope of Red Mountain and ¼ mile N. W. from Rossland. The Le Roi Gold Mining Co., of Spokane, President, W. W. Turner; Gen. Manager, Geo. Turner; Assist. Manager, W. J. Harris; Sec., E. Williams, is capitalized for $2,500,000 in 500,000 shares at $5 each, and owns the Le Roi, the Black Bear and the small fractional claim, the Ivanhoe, or about 72 acres in all.

On this claim the large surface exposure, 6 to 14 feet wide, of the rusty-red iron-stained rock, or the typical iron cap, that on fracture proved to be the covering of a large body of sulphides, mostly pyrrhotite, with some chalcopyrite, could be easily seen for 200 to 300 feet in a N. E. by S. W. direction, when at the west end of this ore shute the vein seems to branch into two or even three smaller veins that diverge, the courses and continuance of which it is believed can be traced for some distance westward. At a point about 300 feet west of its east end line, the shaft was begun and sunk along the upper part of this body of sulphides on a slope of about 45° to the north, which slope or dip after 60 feet began to pitch steeper until from the 350 foot level to the bottom, now about 500 feet deep, it has become nearly vertical. More or less ore was found all the way down, but below the 150 foot work this big ore shute began to widen out. When the under-ground workings were examined (July) the shaft, 8x12 feet and 50 feet below the 450 foot level, was all in first-class ore, or the best ore yet found on this property. On the 450 foot level a very wide stope with all ore underneath, was being worked up towards the 350 foot level, the width of the ore body being the greatest at the west end, or nearly 35 feet, when it is cut off abruptly by a fault that extends up through the workings to the surface and dips easterly towards the shaft at an angle of 65° to 80°. Going east from the shaft this stope averages nearly 25 feet in width, when at a distance of 172 feet from the above-mentioned fault in the west end, the ore shute, now 20 feet wide, is cut off by another fault that crosses diagonally and nearly vertically, a fault that has also been encountered in all the workings above. This 450 foot level has not yet been extended beyond the west fault, but it has been through the east fault, showing a breast of nearly 12 feet of shipping ore, although this may not be the continuation of the large shute, further work being necessary to determine this. In the floor of this level, right in the ore shute, a 300 foot hole is being sunk along the pitch of the vein, with the Sullivan electric diamond drill, which is doing very satisfactory work and has been of great service in prospecting other parts of the mine in the search for and discovery of the faulted parts of the ore shute, and also of large bodies of low grade but shipping ore, back both in the hanging and also the foot wall sides of the main ore shute. Above this level the ore has been stoped for two floors, or 16 to 20 feet, and in the roof is seen 25 to 30 feet of ore, of which 13 to 14 feet is stated to be of the first-class grade, much of it being massive pyrrhotite and copper pyrites.

Coming up to the 350 foot level, the stope is found to be on an average 25 feet wide for nearly 170 feet, or between the two faults, while a drill hole in the hanging has shown that there is still 20 feet more of mixed but good grade ore. The influence of, or rather the displacement by the two faults is again evident, but on the east side after drifting 30 feet beyond the line of work, three drill holes, horizontal, were put in, one into the foot wall, showing, after passing through 20 feet of barren rock, 26 feet of low grade but probably pay ore, while another straight ahead, 40 feet, beyond what has been shown to be another fault plane, ran into a splendid body of ore in which a chamber over 20 feet wide has been made, in which further work was suspended until the ground was caught up with square sets. In the west end of this level near the fault, the stope is 12 feet wide of good ore with 10 feet of mixed ore in the hanging, and five feet in the foot Beyond the fault considerable drifting and prospecting with the diamond drill has been done, with as yet fairly good results.

On the 300 foot level, although a wide stope was made in good ore, a large amount of second-class ore is now being mined, as the system of timbering is advanced, and much ore of this character yet remains up through the upper works, all of which will be mined. All ore now brought to the surface, or 80 to 100 tons daily, is sorted into two classes, *i. e.*, the 1st class or nearly pure sulphides, and the 2nd class, or the mixed diorite and sulphides that comprises 10 to 15 per cent. of the whole mass. Much of the first-class ore is being shipped in waggons to Northport, crossing the Columbia River by ferry, and thence to the smelters, while the tramway is taking an increased amount daily to the Trail smelter, although all ore bins are blocked up and two large piles of nearly 10,000 tons, averaging, it is claimed by the company, $25 to $35 in value, are awaiting shipment.

When the mine is fully equipped and prepared for exploitation in the most systematic manner, it will then be in a position to rapidly extend sinking operations, development level and the breaking and hoisting of much more ore per day, and besides the high grade ore, the large reserves known to exist, of ore averaging $15 to $20 in gold, will be available. Extensive improvements are now in progress. (*a*) A new shaft of two compartments, each 4x5 feet in the clear, following down on the main trend of the ore body, will soon be completed from a point on the surface about 65 feet east of the present working shaft down to the 150 foot level, the sinking of which has been much retarded by the delay in getting the necessary squared timber, 8x8 inches for the upper part and 10x10 inches for the lower. A new hoisting plant is ordered that will consist of a 164-H. P. direct connected hoister, with two independent 5-foot drums, raising two skips of two tons each capacity. This machinery will come from the Jenckes Machine Co., Sherbrooke, Que. The boilers now in use, one 110-H. P., the other 90-H. P., will be utilized. (*b*) At the mouth of the Black Bear tunnel, running in from near the S.W. corner of the claim, on a vein thought to be one of the branches of the main vein, to connect in 700 feet with the present workings at a point above the 350 foot level, there is being installed a large 10-drill air compressor, made by the Rand Drill Co., Sherbrooke, Que., with three 125-H. P. steel boilers, by which very ample power will be got for mining and pumping purposes. The cost of this new plant will be from $40,000 to $50,000. The present plant consists of a seven drill Ingersoll-Sargeant compressor, a Ledgerwood hoist, an Edison dynamo for lighting the mine and operating the diamond drill, 6 Ingersoll-Sargeant rock drills and 3 Little Giant Rand drills, a Cameron station pump, duty 640 gallons per minute against a 150-foot head, and a Knowles sinking pump, although but comparatively little water comes in this mine. On the surface, kept in good order, are the hotel and boarding houses, offices and laboratories, shaft house and ore bins.

Mr. John Moynahan, superintendent, who has had long experience in the Comstock mines, Nevada, and elsewhere, as soon as the above improvements are completed, will have the mine in good condition and the work laid out to give best results. Although the ground is strong, still all the stopes are being heavily timbered with square sets that will be kept close up to the face of work, and extended right up through all the old workings for greater safety and for greater convenience in working out the ore remaining. The new shaft will give good ventilation, though now the 150-foot level is kept very hot by the steam pipes to the pumps. Over 100 men are now employed.

On examining the mine, smooth walls may be seen following approximately the trend of the ore shute, giving the impression that a well-defined foot or hanging wall was there, but on breaking into these walls the ore may be still found. However, in several places it was noticed that the best grade ore terminated along such a wall, or in reality a tight crevice, usually with calcite, pyrrhotite and chalcopyrite arranged with more or less of a banded structure parallel to it, while the ore became of a more mixed character away from it. Again this line of fracture, with a wide band of calcite, may pass through the centre of the high grade ore which gradually becomes of a lower grade on either side. The amount of displacement along the two main faults has not yet been determined, but work done indicates that it is not at all great. Lesser planes of fracture with varying strikes and dips occur all through the mine as is seen elsewhere, and often, as along the main fault planes, there is gouge or crushed rock matter which was not seen along those planes parallel with the ore bodies against which the ore was found concentrated and closely attached. In the mixed ore, the sulphides are segregated along small cracks or seams, and although they often form an integral part of the mass of diorite, close examination might betray often the existence of extremely narrow channels through which the sulphide-bearing solutions gained entrance if these ore bodies were thus formed Again the calcite is found not only along the main planes but more or less through the mass of rock, and crevices are often filled with it. Masses of calcite and sulphide, with some quartz, are segregated in greater or less amount irregularly through the ore-bearing diorite.

The supply of wood and water is nil, the water supply being pumped up from the creek in the Centre Star gulch, but a small box flume is being put in to bring water about 2½ miles from near the Jumbo mine. Means of transport are now excellent, the tramway running to the ore bins, while the Red Mountain Railroad will pass in a very convenient location.

WAR EAGLE, IRON MASK, VIRGINIA AND POORMAN.

Although each of these claims is the property of a distinct and separate company, they are all under one management, Mr. F. E. Lucas, Spokane, being Secretary, and Mr. James Clark, Rossland, Superintendent. All these claims have been Crown granted and lie along the north side lines of the Centre Star and Idaho. The War Eagle Gold Mining Company is stocked for 500,000 shares, at $1.00 each; the Iron Mask, for 500,000, at $1.00; the Virginia, for 500,000, at $1.00, and the Poorman, at 500,000, at $1.00.

The War Eagle, Iron Mask and Virginia are being worked by the use of compressed air, the plant consisting of a 20-drill Rand air compressor and two 100-H.P. boilers, being located by the creek in Centre Star Gulch, and on the line between the Iron Mask and Virginia, and the air carried in pipes to the points of working.

On the *War Eagle*, the vein runs nearly east and west, dip N. 65°, and passes on the east into the Centre Star claim. In the first workings shaft No. 1 was sunk over 70 feet in a shute of low grade ore that assayed from $12 to $16 in gold, but about 300 feet west was found, while the claim was under bond to Mr. P. Clark, a splendid ore shute of high grade ore that averaged over 2¼ ounces in gold from the surface, and in which the stope at the surface, extending down to tunnel No. 1, is 120 feet long and 8 to 12 feet wide, where the ore before being mined was clean sulphides, or pyrrhotite and chalcopyrite. At the west-end of this shute the ore becomes scattered through the diorite, and a fault, strike N. and S. and dip about 60° W., has apparently dislocated the vein about 45 to 50 feet to the south, beyond which the ore was of a lower grade and the stope at the surface was 35 feet long and about 5 feet wide. Tunnel No. 2, 900 feet long, passed through these shutes, No. 1 being the ore followed down by No. 1 shaft, and extending with an average width of 3½ feet for 80 feet. Shute No. 2 was a 100 feet long and was mined out to the surface in the large stope discribed above, but in the floor the ore 2 to 4½ feet wide remains untouched. Shute No. 3 was 40 feet long and worked out to the surface, leaving 3 to 4 feet of ore still beneath.

Tunnel No. 2 is 126 feet, vertically, below tunnel No. 1, 1,100 feet long, and near its mouth is a shaft sunk 35 feet in an ore shute of low but good grade, which follows the tunnel for 160 feet along the floor as if it were the apex of another ore shute, for shute No. 1, in tunnel No. 1, does not appear in tunnel No. 2, but shutes Nos. 2 and 3 appear to come together between the two tunnels, for in the lower tunnel is found, corresponding to the position of the two above, one shute of high grade ore, much of which, taken out in running the tunnel, had an average gross value of $57.60 per ton, 310 feet long and from 2 and 3 feet up to 12 and 14 feet wide of solid ore, which, as yet, has been untouched except (*a*) where a station is being cut for a hoisting plant for a shaft to be sunk from the tunnel level at a point where this shute is widest: (*b*) and in an upraise to tunnel No. 1 which upraise was in ore for 80 or 90 feet when it passed through the barren diorite that on that level separates Nos. 2 and 3 shutes.

Faults have been found all through these workings that have given considerable trouble in tracing out the ore shutes and evidently the same fault that appears at the surface, cut off the big ore shute in the lower tunnel where the ore is 4 to 5 feet wide. But much more development work will be needed to clearly define the courses of these ore shutes and to explain the nature and extent of the slips.

On the *Iron Mask*, shaft No. 1 was started on a narrow crevice, apparently the continuation of the Josie vein, that went down vertically for 20 feet when it began to widen out until the shaft was nearly all in a fine high grade ore that averaged 2.3 ounces, gold, down for 100 feet, when 50 feet of drifting was done. Further work was suspended until the main working tunnel that is being driven in from Centre Star Gulch, starting where a road cutting laid bare the top of a shute of ore, again of first-class grade. The tunnel ran for nearly 120 feet through a mixed ore where a slip was encountered, beyond which the tunnel was then pushed straight ahead for No. 1 shaft, after connecting with which it will turn to the right, and run under tunnel No. 2, War Eagle, at a depth, vertical, of 250 feet. At the mouth of this tunnel, shaft No. 2, with two compartments, is being sunk down on the dip 70° N., and was 36 feet deep with about 3½ feet of ore exposed. A shaft-house has been erected and a gallows frame, and a hoist and pumps operated with compressed air will soon be at work.

The *Virginia* is being developed by a tunnel, then 60 feet long, running to tap an ore body exposed in a small shaft higher up.

The *Poorman* fraction is on the continuation of the Josie vein, and a tunnel is now being pushed forward, it being connected with a 92-foot shaft, and some ore is being taken out.

On the War Eagle, ore bins have been erected, to which will be run a short spur from the tramway, but in the meantime ore is being hauled in waggons and loaded on the cars near the Le Roi, and then sent to the Trail Smelter. Number of men employed by Mr. J. Clark, 80

CENTRE STAR AND IDAHO,

Area about 40 acres; title, Crown grants. Located in 1890, immediately east of the Le Roi and War Eagle, owned by the Centre Star Gold Mining and Smelting Co., President, P. A. Largy; Secretary, T. G. Benham, Butte, Montana; General Manager, Oliver Durant, Rossland. Capital stock, 500,000 shares, at $1.00 each. This property is considered to be one of the best in the camp. Across the east end of the Centre Star claim, runs in a northerly direction Centre Star Gulch, on the east side of which in a diorite bluff is exposed a ledge 30 to 50 feet wide covered with the heavy iron-stained rock or true iron capping from the decomposition of the sulphides here present in mass. On either side of this ledge is a smaller one The main tunnel enters on the out-cropping of this main ledge on the west side of the gulch and runs S.W. about 1,100 feet along the lead, heading for its objective point the Le Roi east end line. Several large bodies of low grade ore are traversed, one of nearly massive sulphides or pyrrhotite being 147 feet long and 14 to 16 feet wide, while another is nearly 70 feet wide. From this tunnel cross-cuts are being run to the side lines, and in one to the north, the "north vein" was cut at 280 feet where it is 4 to 6 feet wide of good ore, with a larger percentage of copper than is found elsewhere in the mine. At 180 feet in the crosscut to the south, the "south vein" was cut but there it is small. Mr. Durant states that besides the large amount of low grade ore now in sight, there is much good shipping ore, but none will be shipped until the mine has been thoroughly explored and opened up for work and the conditions for shipping and smelting are the best. Already nearly 2,000 feet of work have been done, and the ore taken out is being stored in a large dump for future use. There is at the tunnel-mouth a good blacksmith shop and engine room, in which is a 7-drill Ingersoll-Sargeant air compressor and an 80-H.P. boiler, now running three drills in the mine with which 1,600 feet of work have been done since December 5th, 1895. Ventilation is secured by running pipes fitted with compressed air exhausts from the face of work to a shaft sunk on the lead and tapping the tunnel 110 feet from the mouth. After further work has been done a large shaft will be sunk, and a heavy hoisting plant put in, probably near the west end of the claim, and both railways will be easily available. Work will also be done soon to exploit the Idaho ground into which the large exposure mentioned leads, and has been traced through into the Enterprise claim on the east. Number of men at work, 23.

JOSIE, MONTE CRISTO, ST. ELMO, MAYFLOWER.

These four properties have been incorporated under four distinct companies, for all of which Mr. F. E. Snodgrass, Spokane, is secretary, and Mr. Frank C. Loring, mining engineer. The capital stock of the Josie is 700,000 $1.00 shares; of the St. Elmo, 1,000,000 shares at $1.00 each; Monte Cristo, 1,000,000, at $1.00, and the Mayflower, 1,000,000, at $1.00 each share. Under the careful supervision of Mr. Loring all these properties are being economically and systematically developed. The claims all have Crown grant titles.

The *Josie* is situated along the north side of the Le Roi, and south of the War Eagle, and through its length can be traced on the surface two veins, the "main" and the "north" that have been opened up by several workings. The main tunnel was begun in ore, that was soon cut off, and run in along a smooth wall, strike, N.E. by S.W., dip northerly, until a fault was encountered with a throw to the south, beyond which extends a stope for 90 feet that runs up 30 to 40 feet, with ore 1 to 4 feet thick, and connects with the surface by a shaft. At a point about 250 feet from the tunnel mouth, in a short crosscut, a diamond drill hole to the north at 107 feet located ore supposed to be the north vein. Beyond this point the tunnel runs for about 100 feet between two walls, nearly vertical and parallel, 5 to 6 feet apart, with ore in the roof, sometimes 3 feet of solid pyrrhotite, but much sulphide is also scattered through the diorite, and calc spar. Another faulting to the south is now met, and at this point a crosscut is driving north to connect with No. 1 shaft that is being sunk in ore in the north vein, the top of which shaft is 160 feet above the tunnel. A crosscut, south, shows some ore for 12 or 15 feet, while the face of the tunnel, in 180 feet, showed a little mineral. On the surface is a stope about 120 feet long, 3 to 4 feet wide, from which considerable ore was taken, and at the mouth of the tunnel in the ore there found, is being sunk a two compartment shaft, now 80 feet deep, and in ore which is being sorted and shipped with other ore in the mine to Tacoma. In the engine-house, 30 by 60 feet, is a 7-drill Ingersoll-Sargeant compressor, and an 80-H.P. boiler, a good gallows frame, connections with the Cameron sinking pump, and a 30-H.P. boiler. Value, $12,000. A crosscut tunnel is now being run from the Le Roi boundary, 250 feet, to tap the shaft. Number of men, 30; Superintendent, Mr. Long.

The *St. Elmo* is a full claim, 600 by 1,500 feet, on the south slope of Red Mountain, having near the west end a large exposure of very quartzose rock containing also calcite, zinc blende, and iron and copper pyrites. Just east of this is a 100-foot tunnel to the N.W., in a fine grained diorite(?) with much iron and copper pyrites disseminated through the mass. Nearer the east end is the main tunnel, 225 feet long, with crosscut, the tunnel running along a wall E. and W. along which some ore has been taken out. The position of this claim is clearly indicated by a prominent bluff of rock deeply stained with red iron oxides, and the vein traversing the Monte Cristo, the Cliff and St. Elmo Consolidated, is believed to run through this ground. Number of men at work, 5.

The Monte Cristo is another full claim 600x1,500 feet, located on the west slope of Monte Cristo Mountain, one mile west of Rossland, and has running through nearly its entire length, one of the most strongly defined ledges in the camp. The very fine grained country rock is little iron-stained itself, but on the ledge there is a heavy iron capping which, on being opened up, discloses 8 to 12 feet of solid pyrrhotite. Six or seven openings have been made, and work is now being done in a prospecting shaft to be 60 feet deep, tunnel No. 2, about 85 feet, with face all in a coarsely crystalline pyrrhotite, but having in the bottom a better grade of ore containing copper pyrites and calcite, and in tunnel No. 1. This tunnel is to be the main point of entry, and is being driven of a good size, well timbered at the mouth, with sets 5x6x7 feet, having at the time of visit a full face of ore. So far, this large shute of sulphides has proved valueless, assaying from traces to $2 or $3 in gold, but with the advent of a new character of ore in tunnel No. 2 much better assays are being procured, and the development of this claim is being watched with great interest. To expedite work, a 7-drill Ingersoll-Sargeant compressor and an 80-horse power boiler are being put in near the small creek 200 feet below, and then the main tunnel will be rapidly advanced along the vein into the mountain. Course of vein, east and west dip, 70° to 75° north. Number of men, 20. Superintendent, Mr. F. H. Oliver. A spur one-half mile long can easily be run from the tramway to a point below Tunnel No. 1.

The Mayflower is in the "South Belt," or one mile south of Rossland, and the present work is being done in a tunnel, now 100 feet long, run in at track level, upon a vein that was exposed by a rock-cutting on the tramway. This vein, running about east and west, dip north 70° to 80°, showed for 30 feet along the tunnel, carbonates, until the solid ore came in, or solid iron pyrites, with a large proportion of galena, also some zinc blende and calcite carrying the chief value in silver, or in a shipment netting $56, $40 was silver, $10 gold, and $6 lead. The vein varies in width from a few inches to 3 feet, and can be traced by openings through the claim, while a parallel vein to the north has been more or less developed. The carbonates are sacked and some have run as high as $250, and the ore taken out is being piled by the track, and sent down in lots to the smelter at Trail. Number of men employed, 10. Superintendent, F. H. Oliver.

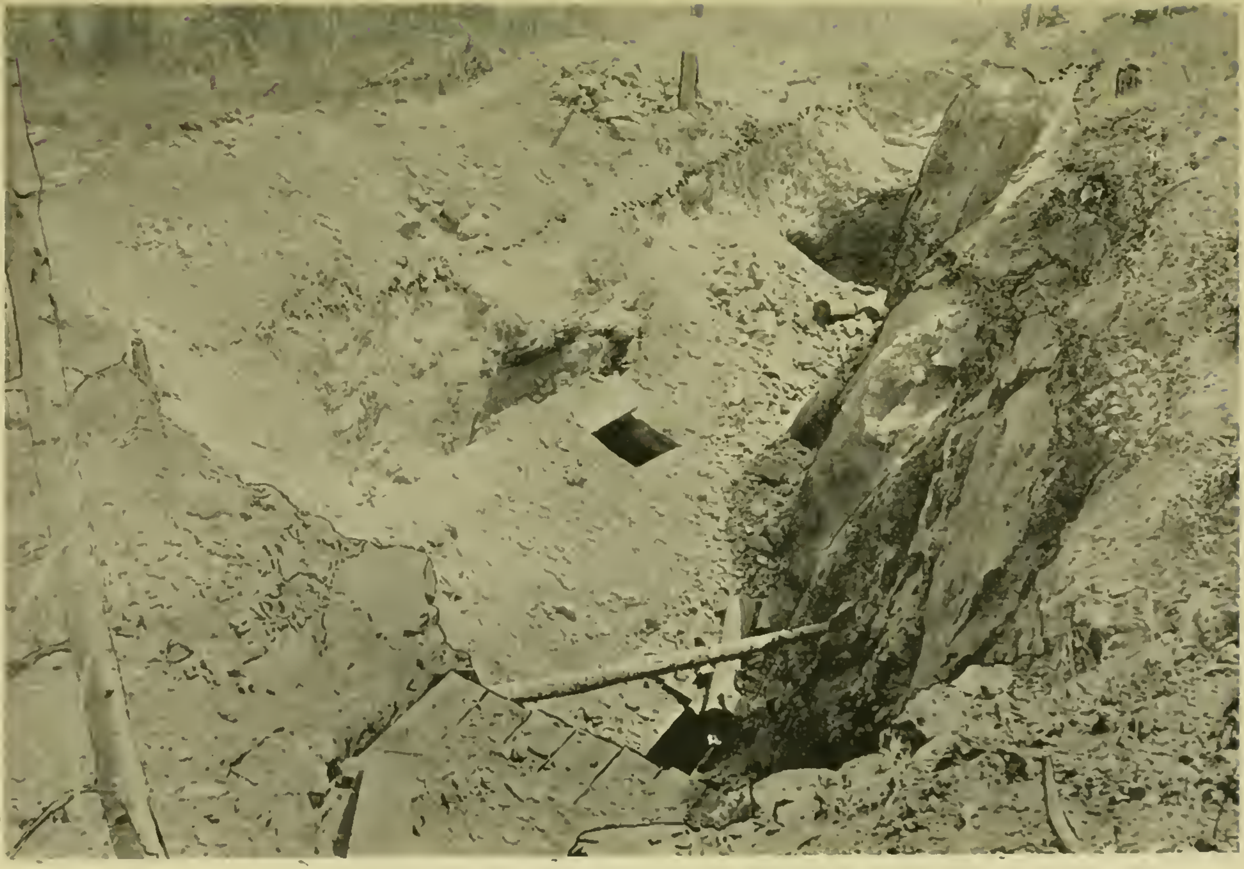
North of the Le Roi and War Eagle lie a number of claims on which ore has been found, and on which work is being done, as at *No. 1*, *Surprise*, *Gertrude*, *Monita*, *and Pilgrim*, and on the *Mug Wump*, that lies just north of the *Iron Mask*, a plant is now being put, under the management of Mr. J. Young, to exploit this property with the diamond drill.

CALIFORNIA.

Area, 52 acres ; title, Crown grant. Location, 1,500 feet west of the Le Roi and Josie mines, on south slope of Red Mountain, owned by the California Gold Mining Company, Spokane. President, Hon. R. F. Pope, Cookshire, Quebec ; Secretary and Treasurer, J. P. Graves, Spokane. Capital stock, 2,500,000 shares at $1 each. Near the southern end of this claim is a 50-foot tunnel running north into barren country rock, and higher up are several shallow cuts and trenches. On all this claim the rock on the surface is very much iron-stained and decomposed, but no work has been done as yet disclosing the veins that are supposed to pass through this property. Mr. Frank C. Loring, one of the best mining men in the camp, will also direct the development work, which will consist at first of extensive surface work, trenches, and open cuts, etc.

NICKEL PLATE.

Area, about 21 acres ; title, Crown grant. Location, immediately south of the "Centre Star," and "Idaho." This claim, and the small fraction, "Ore-or-No-go," are the property of the Nickel Plate Mining Company, of Salt Lake City. Capital stock, $500,000, in $1 shares Superintendent, W. J. Williams, Rossland. Considerable careful development work has been



WAR EAGLE MINE, ROSSLAND.

(See page 22.)

SHOWING STOPE ON SURFACE 10 TO 14 FEET WIDE FROM WHICH WAS MINED SOLID HIGH-GRADE PYRITOUS GOLD ORE. THIS STOPE EXTENDS DOWN TO THE TUNNELS BELOW, AND HAS THE PLATFORM SHOWN WITH OPENING TO LADDER-WAY, TO PROTECT THE WORKINGS BELOW.

done on this property, a shaft 150 feet having been sunk along a smooth wall with some ore present. At the 100 foot level a drift has been driven over 100 feet east and 110 feet west (July), showing more or less ore, dip 60 north. From the shaft a cross-cut has been driven 285 feet north through the diorite, intersecting at 110 feet a shute of ore, which, in a stope 25 feet high, is 2 to 3 feet wide, of solid sulphides, consisting of pyrrhotite and copper pyrites, stated to be of high grade. This ore is also found scattered through this rock or gangue, and over a hundred tons are on the dump awaiting better shipping facilities, as the line of Rail road is surveyed to cross the claim near the shaft that will give easy access to the smelters. The crosscut will connect with the air-shaft, which is now being sunk near where on the surface some ore is showing, and, after further development work proves up the value of the claim, a large and complete hoisting plant will be installed, the present plant — a 12 horse-power boiler, blower, and a Knowle's sinking pump — being sufficient for the present exploratory work. Number of men employed, 22. In Centre Star Gulch a shaft is being sunk on a vein that out-crops there, and ore is being taken out.

CITY OF SPOKANE.

Altitude 3,900; area, 20½ acres; title, Crown Grant. Location, on the west slope of Monte Cristo Mountain, and east slope of Red Mountain, north of the "Iron Mask," and half mile north of Rossland. Owner, the Lillooet, Fraser River and Cariboo Gold Fields Company, Limited. Managing director, F. S. Barnard, Vancouver, B. C.; Secretary, E. A. Bennett, London, England; Superintendent, D. McGuire, Rossland. On this claim a prospect shaft having disclosed the presence of ore, a tunnel 6x5 by 6½ feet in the clear is now being run easterly from a point near the centre of the claim, just above the road, and on a level with the tramway, 500 to 600 feet distant, and in the face of the tunnel, 85 feet, in is a width of nearly 3 feet of solid pyrrhotite and iron pyrites, carrying some copper pyrites and gold, while on the north side more or less ore is seen for 15 feet back, the average value of which has not yet been determined (July 13). An air compressor plant, a 3-drill, 12x16 "Rand," bought of Fraser and Chalmers, Chicago, and one 45-horse power boiler, will soon be installed at the mouth of the tunnel, which will then be rushed ahead vigorously to exploit this property, to determine the extent and grade of the gold ore now showing; and if favourable results are obtained, a proper working shaft will be sunk, while transportation facilities, as shown above, will be excellent. A small stream of water close by will supply the compressor and boiler, while there is considerable wood suitable for fuel, but limited in amount for mine purposes on the property. So far, three houses for the men and superintendent have been erected. Number of men employed, 18.

RED MOUNTAIN.

Title, Crown grant, applied for. Location, south of Cliff Mine, and west of the City of Spokane. Owned by the Red Mountain Mining Company. Secretary, F. Lewis Clark, Spokane. Capital stock, 1,000,000 shares of $1 each. Superintendent, B. Young, Rossland. Work is being now done on a fissure, along which at the surface as much as 3 to 4 feet of low grade pyrrhotite with some copper pyrites and sulphides have been found. A working shaft, 20 feet deep at time of visit, is being sunk, while about 350 feet east a tunnel 85 feet in length is cross-cutting the country rock in search of the ledge that shows immediately above on the hill. Number of men, 10. Foreman, D. W. Peoples.

CLIFF

Area, 15.7 acres. Title, Crown grant. Location, east slope of Red Mountain, one mile north of Rossland. Owned by S. M. Wharton, Geo. C. Wharton, Jno R. Cook, *et al*, Spokane. Gen. Manager, S. M. Wharton. The well-defined lead on this claim is believed to run through the St. Elmo Consolidated, St. Elmo and the Monte Cristo. About the centre of the claim is a 45-foot shaft, full of water, with several tons of ore at the top, and below in the hillside several open cuts along the ledge from which there has been taken high grade ore. The lead can be easily traced through the claim, but the faults met with in the underground workings show plainly at the surface. In a tunnel 350 feet long, with 100 feet of cross-cuts, there is for the first 90 feet solid ore, low grade, averaging 4 feet wide, then a slip throws the ore 20 feet to the north-west, the shute then continuing for 65 feet, beyond which it is much broken up and a small stringer of ore 2 to 10 inches wide is found running east and west. One hundred feet lower down is tunnel No. 2, now being driven ahead with a machine drill. For 65 feet the tunnel is all in the coarse grained pyrrhotite that assays a few dollars in gold, with a fault of 5 feet to the north and the continuation of this shute for 90 feet further, being in places 12 feet wide but also low grade. Faults are now met with, beyond which the ore has not yet been found. At the upper or west end of the claim it is claimed the best ore has been found, and tunnel No. 2 will be run through to develop this ground. Considerable ore has been shipped but so far it has proved to be of such a grade as left but a small margin of profit. At the engine house are a 3-drill Ingersoll-Sargeant compressor and a 35-H.P. boiler. No. of men 14. Strike of vein nearly S. W. by N. E. Dip N. W. 60° to 80°.

Immediately west of this claim is the *St. Elmo Consolidated.* Title, Crown grant. Owned by Jno. R. Cook, S. M. Wharton, *et al*, not being worked. A shaft 48 feet deep and a tunnel about 60 feet long comprise the work done, and at the shaft a considerable amount of iron sulphides is piled up. West of this claim is the St. Elmo already described, while north of these claims is the *View*, near the summit of Red Mountain, owned by the Red Mountain View Co. President, W. S. Johnson, Sec. A. F. Corbin, Rossland. Capital stock, 1,000,000 shares at $1. Title, Crown grant. A tunnel 45 feet long begins on a vein about 15 inches wide and then runs S. W. along a narrow width of ore that in the face of the tunnel widened to nearly 3 feet of mixed ore, or diorite, pyrrhotite and a good percentage of copper pyrites. This tunnel will be now advanced under the charge of Mr. W. S. Haskins, of the Jumbo mine

West of the St. Elmo is the *Mountain View*, in a tunnel on which considerable mixed ore is in sight, and below which the main tunnel was being started. North of the St. Elmo and on the summit of Red Mountain are two fractional claims of about 18 acres in all, the *Peak* and the *Sam Hayes.* All the surface rock is heavily iron stained, but very little work has yet been done to show the condition of affairs, however in several small openings there is exposed more or less rock matter impregnated with iron and copper pyrites. These properties have lately been bonded to Mr. Pritchard, London, Eng., who purposes doing extensive exploratory work with the diamond drill.

JUMBO.

Area, 21.6 acres. Title, Crown grant. Location, 2¼ miles west of Rossland on west bank of east fork of Sheep Creek. Owners, the Jumbo Gold Mining Co. General Manager, M. R. Galusha, Spokane; Superintendent, W. S. Haskins, Rossland; 1,000,000 $1 shares On this claim is a very prominent exposure of iron-stained, fine-grained eruptive rock with more or less decomposed sulphides, in which a shaft was sunk showing some low grade ore, and afterwards a tunnel was run in about 260 feet with about 125 feet of crosscuts. For 150 feet there was no ore, then the tunnel entered and continued for nearly 90 feet in a body of very low grade, coarse-grained pyrrhotite in which however there is ore containing some copper pyrites, mispickel and calcite that carries enough value in gold to make it shipping ore. No ore has yet been sold. A good waggon road, 1¼ miles long, has been built from where the Red Mountain Railroad will intersect the Northport road up to the mine, and a new tunnel is now begun about 200 feet north and 175 feet below the upper tunnel described, and as this advances, crosscuts will be run. The trend or conditions of this large body of sulphides are not known, but immediately to the west is what appears to be a large dyke of very coarse-grained syenitic rock from 200 to 300 feet wide, strike N. and S. An air compressor and a diamond drill may be bought to expedite exploratory work. No. of men at work, 7.

Near the claim, the High Ore is being prospected by a tunnel at the north end line of the Jumbo, for the continuation of the Jumbo ore shute, while across the creek the Nevada is also running a tunnel in search of the same. The Good Hope has piled up at the top of a small shaft some low grade ore, but no work was being done at time of visit. North from the Jumbo, the Gold Hill has run a tunnel 350 feet west to strike an ore shute high up on the line but without success, and the Comet is being prospected with open cuts and a shaft.

THE O. K.

Title, Crown grant. Location on the south slope of Spokane Mountain, off the Northport road, 2½ miles west of Rossland. Owned by the O. K. Gold Mining Co. Capital stock 1,000,000 shares at $1 each. Gen. Manager, J. L. Warner, Rossland. On this claim are found conditions quite different from any other in the camp, there being a regular fissure vein with a quartz gangue, containing free gold, and also a good percentage of sulphurets, such as iron and copper sulphides and galena, the country rock being a fine grained eruptive rock. Three tunnels have been run in, one for about 70 feet, the second for 400 feet, and the upper nearly 300 feet. The vein presents the usual characteristics, varying much in width from a few inches to five and six feet of ore, in which considerable stoping has been done, the ore going to a small 5 stamp mill, by which the free gold was amalgamated, and thence to concentrators, the Perfection bumping table and a Woodbury machine, by which the sulphides were saved. At present a new mill is being erected, to contain at first two 5 stamp batteries, two Blake crushers, automatic feeders and concentrators. In the engine room will be two 10-H.P. boilers and a 5-drill Rand air compressor, for operating rock drills, and a diamond core drill. The ore will be brought from the mine in a gravity car-tram, 600 feet long and dropping about 200 feet, while the water for the mill will be pumped up with a steam pump from Sheep Creek. It is stated that about $20,000 have been taken from this mine, but an exact authorative account could not be obtained in time for this bulletin, but will be included in the next annual report.

Great Western and Golden Chariot.

Area, 66 acres. Title, Crown grants. Location, foot of Monte Cristo Mountain, and north of Rossland townsite. Owners, the Great Western Gold Mining Co. Secy. H. M. Stevens, Spokane; Gen. Manager, C. E. Barr, Rossland. Capital stock, 1,000,000 shares of $1 each. This claim is traversed in a N. E. and S. W. direction by a wide iron-stained mineral zone in which three prospect shafts have shown low grade gold ore assaying $3 to $4, this ore being in places massive pyrrhotite but mostly diorite impregnated with this sulphide and some iron and copper pyrites, also calcite. No definitely defined ore body has yet been found, though prospecting is being done by sinking vertical and inclined diamond drill holes from the bottom of a 50-foot shaft near the centre of the claim, but near the east end a shaft will soon be started, and with an air compressor, about to be ordered, systematic prospecting will be prosecuted with all speed by Mr. Barr, who has done much mining in Colorado. Near the west end is exposed a narrow vein, 2½ feet wide, of solid sulphides, as yet of small value in gold, in which is a 22-foot shaft. This property has large surface showings, and, being owned by a strong company, will be carefully explored.

The Enterprise.

Area, 20.65 acres. Title, Crown grant. Location, at foot of Monte Cristo, east of Idaho, and west of Great Western. Owned by the Enterprise Gold Mining Co., of Ohio. Capital stock, 1,000,000 shares at $1 each. Gen. Manager, W. A. Ritchie, Spokane. This property is in the hands of a strong eastern company who intend extensive development work, and are at present prospecting the surface by trenching and sinking test shafts. Near the N. W. corner two shafts are sunk in the vein from the Idaho, in which there are from 2 to 4 feet of ore, low grade, of massive pyrrhotite with some iron and copper pyrites. Number of men, 7.

Evening Star.

Area, about 20 acres. Title, Crown grant. Location on the east slope of Monte Cristo Mountain, between the Monte Cristo and Georgia claims, and one mile north of Rossland. Owned by the Evening Star Gold Mining Co. President, D. M. Drumheller; Secretary-Treasurer, Jules Prickett, Spokane. Capital stock, $1,000,000 in $1.00 shares. Superintendent, J. M. Scratford, Rossland. On this claim is seen a large exposure of much decomposed rock through which appear to run two ledges, but at present it is yet difficult to form any definite idea as to what are the true conditions. Considerable stripping has been done, and from this ore taken from the surface, 22 tons shipped to the smelter at Tacoma, netted $32.80 in gold, per ton, as per statement by letter from Mr. H. B. Nicholls, until recently Secretary-Treasurer. A tunnel was run into this rock 50 feet, with ledge matter at the mouth, but nothing was found until recently. On continuing this work a few feet, a small stringer of ore widened out to a considerable width, in which was quartz showing free gold. Sixty feet below this tunnel a second is being driven, which at about 135 feet is expected to strike the ore found above, but as yet, development work must be awaited, and in the meantime all ore taken out is being piled. A short haul by waggon road will land ore at the tramway. Number of men, 11.

C. and C.

Area, 13 acres. Title, Crown grant. Location, south of the Evening Star. Owned by J. H. O'Leary, Capt. Gore, Philip C. Woolly, *et al.* A shaft, 6 by 6, was down 30 feet, all in a low grade mixed ore of fine grained diorite and pyrrhotite, copper pyrites, mispickel and calcite, and, encouraged by this very favourable showing, work is being advanced as quickly as possible. Number of men at work, 8. The continuation of this vein is believed to be on the S.E. end of the Monte Cristo claim.

GEORGIA.

Area, about 50 acres. Title, Crown grant. Located on the east slope of Monte Cristo Mountain, east of the Evening Star and C. & C. Owned by the Georgia Gold Mining Co. Capital stock, 1,000,000 shares, at $1.00 each. General Manager, Jas. L. Warner, Spokane. Superintendent, — Newman, Rossland. On this claim a tunnel was started in under an iron capping. cutting through 4 or 5 feet of mixed ore and rock, and run about 100 feet with a crosscut 40 feet west, and another 16 feet. Several feet below, another tunnel is being driven S.W. with a machine drill operated by steam, and was in 80 feet (June 30) in a very fine grained, light coloured rock, the intention being to push forward this work to prospect the claim on the surface, of which in many places is found the rusty iron-cap and sulphides assaying in gold. Number of men at work, 12.

IRON HORSE.

Title, Crown grant. Located east of Virginia, on south slope of Monte Cristo Mountain. Owned by the Iron Horse Gold Mining and Smelting Co., Spokane Capital stock, 1,000,000, $1.00 shares. There is a large ledge exposed on this property in which are sunk two shafts, to one of which is run a tunnel about 100 feet long and then crosscuts, exposing a large body of sulphide ore, pyrrhotite and copper pyrites, of which there is a large amount on the dump, but the value of which was not ascertained. Prospecting with the diamond drill is being carried on by Mr. Hector McRae, of the Kootenay and Columbia Prospecting and Mining Co., who has a contract for sinking 1,200 feet of holes.

Several other properties on this mountain are being explored, such as the Silverine, Iron Colt, and North Star.

COLUMBIA AND KOOTENAY.

Title, Crown grant. Location on N. E. side of Kootenay Mountain, 1¼ miles N. E. of Rossland. Owners, the Trail Mining Co. Stock, 2,500 shares, at $100 each. President, H. P. Mason, Frankfort, Kentucky; Secretary, Geo. E. Milligan, Chicago, Ill.; Superintendent, Martin King, Rossland. Besides these claims, this company owns the adjoining locations, the Tip-Top and Copper Jack. On the Columbia-Kootenay property, much prospect work has been done, disclosing by means of tunnels, shafts and open cuts, the existence of an ore-bearing zone running N.E. by S.W., dip 45° to 75° N.W. through both claims, the rock on the surface heavily iron-stained, with decomposed masses of sulphide ore exposed, which proves to be (*a*) pyrrhotite, both massive, and scattered through a hard fine grained gangue with a little chalcopyrite, and (*b*) more or less mispickel or arsenical iron ore; the surrounding country rock being diorite that may be found from very fine close grained to typical coarse grained rock, exhibiting distinct crystals, in places, of biotite mica. In the underground workings, as far as examination was permitted by the presence of water accumulated since suspension of exploratory work, which will be further prosecuted after the installation of the air compressor plant, much of the ore appeared to be strung out in irregular laminæ of sulphides, calcite, rock matter, and some quartz; but the relation, if any, of such arrangement to walls or planes of fracture could not be determined for the above reason. The ore also is found massive, or scattered through the gangue or along many small cracks, as was clearly seen in a lower shaft where the sulphide was iron pyrites. At the north end of the Columbia claim a porphyry dyke that can be traced with almost a certainty for over two miles, 30 to 40 feet wide at the least, crosses the upper tunnel at its mouth, on a course running true N. and S., but no radical displacement is yet apparent, and on both sides of the dyke solid sulphide ore has been found, while in one place a stringer of quartz was noticed between the dyke and the diorite. Two carloads of ore have been shipped to the smelters to determine its value, one carload from one part of the mine proving too low grade to be profitable under existing conditions, the other from another part yielded, it is reported, over $50 in gold per ton.

Upon the south end of the Copper Jack claim, convenient to a stream of water, an air compressor plant is being put in place, to consist of a 30-drill Ingersoll-Sargeant compressor, and three 125-H.P. boilers, whence air will be carried in a 6-inch pipe to the two tunnels, 700 and 850 feet, respectively, higher up the claims, and if further work warrants it, a tunnel will be run a little above the plant. The value of plant to be about $20,000. There is an abundance of good timber for fuel and mine purposes, and for transportation facilities the surveyed line of the S. F. and N. R. R. passes below the present workings, while a good waggon road from Trail leads up to the site of the engine house. This is the property most developed upon this mountain, and its success will mean the active development of other and contiguous claims. Men employed (July 6), 15, preparing site for plant.

South Belt.

On Lake Mountain, south of Rossland, and in the intervening valley, also on the east and south slopes of Deer Park Mountain, all of which, with Look Out Mountain further east, may be known as the South Belt, the same system of east and west fissures obtain, and, with the comparatively little work done, the results are such as to encourage the much more extensive investigation of many of the claims. With the exception of the Crown Point and Deer Park, the ore bodies have not yet been found of large size, but the fissures are very persistent and the average ore is of, so far, fair value, the ore on most of these properties being different from the rest of the camp in that there is very little pyrrhotite, but much iron and arsenopyrites, with some zinc blende and galena, while the silver value is higher than the gold. But pyrrhotite ore is also found as will be detailed below. The construction of the tramway through the centre of this belt has rendered easy the shipment of ore, and already the Crown Point and Mayflower are shipping.

G. R. Sovereign.

Area, 52 acres. Title, Crown grant applied for. Location, about one mile south of Trail, on Look-Out Mountain, and about 1,400 feet above that town. Bonded to Gen. J. Warren, Butte, D. R. Harris, Victoria, *et al.* Much interest centres in the prospect work being done on this claim, that is six miles east of Rossland, and in a shaft, now over 30 feet deep, ore has been followed all the way down, consisting of low grade pyrrhotite in the diorite, until now, when more copper pyrites, quartz and calcite are coming in with a rise in the gold assay values, an assay for Gen. Warren on all the ore coming out recently, giving $16.40. On the surface the rock is much iron stained by the decomposed sulphides present, and work is to be pushed much faster to prove up the claim before the expiration of the working bond, May 1st, 1897. This very favourable showing on this mountain is promoting other work, and some claims will be prospected with the diamond drill by Mr. Hector McRae.

Crown Point.

Location, on the south belt, south of Trail Creek, on the north slope of Lake Mountain, 2½ miles S. E of Rossland. Titles, the Crown Point Crown grant, No. 981, White Swan and Hidden Treasure, locations. This group of three adjoining claims is the property of the Crown Point Gold Mining Co, Spokane, Wash. Pres., Jno. B. Finch; Secy., H. K. Galusha, Spokane; Superintendent, V. D. Williamson, Rossland. Until last April the Crown Point was under different management, under whose direction a shaft or incline, dip about 50°, was sunk 130 feet, encountering at 60 feet a dyke, which is now clearly shown upon the surface as 30 to 40 feet wide, strike north and south, dipping to the east 60°. Owing to bad air and water it was impossible to inspect the lower workings, but they were described as consisting of a drift at the depth of 70 feet, for 90 feet along the dyke, having, for 60 feet, ore, while at 50 feet a wing was sunk 20 feet, again along the wall of the dyke, at the bottom of which it is claimed there were four feet of solid sulphides. At the bottom a drift was run west 100 feet with a cross-cut 50 feet, and an east drift of 75 feet, with a 50-foot cross-cut, all in barren diorite, the workings having probably been deflected from the ore zone by following along the dyke. On the surface on either side of the dyke, apparently with little or no displacement, is exposed, when the iron capping is removed, a body of sulphide ore, or massive pyrrhotite with some copper pyrites, from 3 to 8 feet wide, strike, a little north of west, dip, S. into the mountain 45° to 60°, the enclosing country rock being a fine grained diorite, so common in the claims along this slope. At the top of the shaft the ore is about 7 feet wide, and down it for 35 feet it is 3 to 5 feet wide, while it is fully 7 feet wide where it is being stoped out.

A waggon road has been built for about ½ mile down to the C. & W. R. R tracks, from which a spur can easily be brought to a point below the main tunnel that is now being driven

350 feet to tap the ore shute 150 feet west of the dyke, 170 feet below the surface. On the dump were piled several hundred tons of ore, of which regular shipments to the Trail smelter have begun, the first returns for which are reported as being very satisfactory. Number of men, 14.

West of this property are three claims, all held under Crown grants, the *Tiger*, *Uncle Sam*, and *Gem*, through which runs what is believed to be the continuation of the Crown Point lead, the country rock being a fine-grained greenish diorite. On the Gem and Uncle Sam two shafts were sunk near the dividing end line, and some low grade ore taken out, consisting of mispickel with some copper pyrites and zinc blende and some quartz and calcite, but no work was being done at time of visit. On the Tiger a cross-cut tunnel was in 160 feet east to explore the ground under a heavy iron capping on the surface. To the south of this an open cut into the iron capping uncovered 3 to 4 feet of very good-looking ore which a tunnel and cross-cut below failed to strike. Work has been retarded by bush fires that lately destroyed all the buildings. Agent, Mr. N. Campbell, Rossland.

South of the Crown grant are three claims, the *Southern Cross*, *Wolverine No. 2*, and *Iron Hill*, on the first of which is a Crown grant, owned by the Southern Cross and Wolverine Consolidated Gold Mining Company. President, Thomas Smiril; Secretary and Treasurer, D. B. Bogle, Rossland. Capital stock, 500,000 $1 shares. On the Southern Cross two open cuts and two tunnels, one 75 feet, the other 90 feet long, are made in the very iron-stained diorite to develop a well-defined fissure, in which the ore in places widens out from nothing to 2 or 3 feet of solid sulphides. In the 90-foot, or working tunnel, at ten feet, is encountered what is probably the Crown Point dyke, down along which a winze was sunk 25 feet with 2 or 3 feet of low grade pyrrhotite, copper pyrites, and blende, when water caused work to be stopped. On the Wolverine there is a large exposure of iron-stained rock with stringers of sulphides, but no work has been done yet to develop the conditions that may prevail.

Further west, are the *Trilby*, *Last Chance*, and *Celtic Queen*, on the last of which 2 to 4 feet of mixed sulphides have been found along an east and west fissure that is crossed by a large north and south dyke without any observable displacement. Development work is now proceeding under Mr. Dennis Clark, Rossland.

R. E. Lee and Maid of Erin.

Area about 100 acres; title, locations. Located one mile south of Rossland. Owned by W. Norris Dunn and M. Sullivan, Rossland, but bonded to the R. E. Lee Gold Mining Company. President, Charles S Vorhees; Secretary, H. L. Wilson, Spokane. These claims were bonded by Mr. John M. Burke, but no work is being done at the present time. The principal work has been done near the centre of the dividing end line of the two claims; as on the R. E. Lee, there is a 30-foot tunnel with a 20-foot drift, in the floor of which can be seen 2 to 3 feet of mixed ore in a lead running east and west and dipping north 60°. About 50 feet west, but on the Maid of Erin, is the main shaft, 74 feet deep, with a level at 50 feet, running 47 east, and a cross-cut 24 feet north. As water filled these workings they could not be seen, but on the surface there were piled several tons of ore, consisting mostly of fine-grained mispickel, or arsenopyrite, the value of which was not ascertained; but Mr. Dunn reports that from 12 tons taken from the tunnel the net smelter return was $458 for the lot in gold. About 500 feet south of this lead a 30-foot shaft is sunk in a second vein of mispickel, 2 to 14 inches thick, said to assay well in gold, dip and strike the same.

Immediately west of this property is the *Gopher*, not working, from a 60-foot shaft in which has been taken considerable ore, similar to that of the R. E Lee, and which is thought to be on the same vein that runs into the next claim to the west, the Homestake To the south is the Mayflower, already described.

Homestake.

Area, 21.3 acres; title, Crown grant. Location, three-quarters of a mile south of Rossland. Under bond to the Homestake Gold Mining Company. President, S J. Johnson, Rossland. At the time of visit (July 9th) no work was being done, and the workings were full of water; but, however, at all of them there was piled up considerable ore, not high grade, or iron pyrites and marcasite, or "white iron," with some copper pyrites and zinc blende, with calcite and quartz in the diorite This vein can be traced for nearly 700 feet through the claim by cuts, strike east and west, dip 70° north. A tunnel runs in a considerable distance, but not on the lead, while at the mouth is a small shaft said to be all in ore, in some of which piled on top is galena. A short distance east are two shafts, 75 feet apart and connected by a drift, one being 90 feet deep, in which workings was ore, of which about 100 tons were on the dump, 50 or 60 feet from the tramway. The proper and thorough opening up of this promising property only awaits the settlement of the bond and sufficient capital to adequate work.

North of this claim is the *Freeburn* claim, Crown grant applied for, on which a 25-foot shaft, near the tramway, starts down on a narrow crevice, strike nearly east and west, which, near the bottom, widens to a few inches of ore, similar to that found in the Homestake.

West of this claim, and south of Rossland townsite, is the *Nest Egg* mining claim; title, Crown grant; owned by the Nest Egg Gold Mining Company, of Victoria. On this property there appear to be two leads in which the ore is now pyrrhotite and copper pyrites, similar to most of the ore now shipped. Near the discovery post is a shaft now filled with water, but showing at the top more or less sulphides scattered through the diorite, of which 2 or 3 tons were piled on the dump. About 100 feet south is the second lead, strike about south-west and north-east, dip northerly, on which is an open cut for 20 feet and then a shaft filled with water, with mixed ore near the top, and several tons on the dump. West of this opening is a second, a shaft 30 feet deep now being sunk, at the top of which is 1½ to 2 feet of ore, which improves in depth, several tons of good looking ore being piled up, or pyrrhotite and copper pyrites, fine grained, and impregnated with quartz.

The *Phœnix*, title, Crown grant, owned by the Phœnix Gold Mining Co., General Manager, Mr. J. K. Clark, has a 30-foot shaft now being sunk 50 feet more, in which is ore similar to that found on the Nest Egg, or mixed sulphides and diorite.

North of the Homestake, and west of the Mayflower, are the *Blue Bird* and *Curlew*. The Blue Bird, agent, Ed. Bosquet, Rossland, is believed to be the extension of the Mayflower vein, and in a shaft 22 feet deep, on 2 to 3 feet of mixed ore, of which about ten tons are on the dump, a fine grained iron pyrites and mispickel, blende and galena. Further surface prospecting is now being done. On the Curlew, owned by John Earle and Jos. Vogel, is a 43-foot shaft in which is a vein of 6 to 10 inches of ore similar to that of the Blue Bird, which has given assays of $6 to $10 in gold and 70 to 80 oz. silver. When water leaves the shaft, or soon, work in the shaft will be continued.

One-half mile west of these claims, along the Dewdney trail, considerable work is now in progress, and that on the Zilor, Lily May and Deer Park, may be mentioned. The *Zilor*, owned by W. Perdue and W. J. McKay, but bonded by E. Morrison, of Victoria, has 3 shafts full of water, the one at the east end being in barren diorite, while on a 30-foot shaft is considerable ore on the dump similar to the Lily May ore. Further west is a 60-foot shaft that started down in a good body of ore, but passed into barren rock, although ore is reported to be in the bottom.

LILY MAY.

Area, 13.87 acres. Title, Crown grant. Location, 1¼ miles south of Rossland on the Dewdney trail. Owners, Lily May Gold Mining Co., of Spokane, Wash. Pres., George Turner; Sec.-Treas., Frank Kizer, Spokane; Superintendent, Frank Watson, Rossland. Capital stock, $1,000,000 in $1 shares. This is the oldest claim in this camp, having been located in 1889 by Jos. Bourgouis, but recorded in 1890 by Oliver Bordan. In a very fine grained rock, probably a diorite, the iron-capped outcrop was traced for some distance and a tunnel started on a vein running N. W. by S. E., dip, N. E. 50° to 60°, following ore that assayed in silver, gold and lead, silver being predominant, for nearly 40 feet. Since this the tunnel has been advanced to 85 feet, with some mineral all the way, when it connects with an incline from the surface, 37 feet above, in which the ore petered out, but in a foot widened out again to 3 or 4 feet of solid sulphides, consisting of white iron or marcasite and iron pyrites with zinc blende. A winze is being sunk now at this point, that at 12 feet passed into barren rock to again expose at 52 feet ore 3 to 18 inches wide (July 10th), consisting of quartz gangue and pyrites that yields on assay a good value in gold and silver, although it must yet be rated as low grade ore. To the south two small shafts point to the existence of a second lead on this property, which is being carefully prospected, while ore encountered in development work is being sorted and stacked. A road ½ mile long, and of an easy grade, can be made to the tramway when enough ore of good grade can be mined. Mr. Watson, while actively pushing the working of this property, has begun the prospecting of the Black Horse claim to the west. Number of men employed, 12.

DEER PARK.

Area, 52 acres. Title, Crown grant. Location, on east side of Deer Park Mountain, 1¼ miles S. W. of Rossland. Owned by the Deer Park Gold Mining Co. Pres. L. W. Mulholland;

Sec., R. L. Rutter, Spokane. Capital stock, 1,000,000 shares of $1 each. Gen. Manager, E. J. Kelley, Rossland. On this property is one of the largest bodies of sulphides in this district, in which a shaft 60 feet deep and 47 feet of cross-cut are altogether in this very low grade massive pyrrhotite. In the bottom of the shaft the ore was showing some change in that some chalcopyrite and quartz were coming in, which may lead to improvement in the grade of the ore, and to a shute of pay ore.

In the valley south-west of the town work is being done on several claims, such as the Commander, Palo Alto and San Joaquin, Butte, Florence, Alameda and Tramway.

COMMANDER.

Area, 52 acres. Title, Crown grant applied for. Location, 1¼ miles S. E. of Rossland on the road to Trail. Owners, the Commander Mining and Smelting Co., Spokane. General Manager, W. J. Harris; Secy.-Treas., Frank Watson, Rossland. Capital stock, $1,000,000 at $1 each. After considerable work had been done on the surface by trenching, a shaft, 5 by 9 feet, was begun on an outcrop of mineralized rock east of a porphyry dyke that runs nearly north and south. It follows down on a smooth wall for some distance, several tons of ore being taken out in sinking. At the bottom (73 feet July 10th) the diorite carries more or less copper pyrites, and assays in gold from $4 to $13 per ton. There is a 20-H.P. boiler, a good gallows frame, and a small sinking pump that was not working very well, thus retarding more rapid sinking, although not much water was coming in. On reaching a depth of 100 feet, drifts will be run east and west to explore the ground, and ore can be shipped by waggon to Trail, or to the tramway, about ⅓ of a mile distant. Foreman, J. Houghton. Number of men, 12.

PALO ALTO AND SAN JOAQUIN.

Area, each claim is of full size; title, Crown grant. The Palo Alto is owned by the Palo Alto Gold Mining Company, Spokane, P. A. O'Farrell, President, and the San Joaquin by the San Joaquin Gold Mining Company, Limited, of Victoria. Trustee, Hon. D. W. Higgins. Through these properties, all east and west, a vein has been traced for some distance; that near the separating end-line is crossed by the porphyry dyke, to the west of which, on the Palo Alto, is a 31-foot shaft, down which for 17 feet was oxidized matter, and after that to the bottom up to a width of 3 feet of ore, or fine grained arseno-pyrite. One hundred feet west of this is an open cut, on six feet of ledge matter, in which not enough depth has been attained to reach unaltered ore. East of the dyke on the San Joaquin, a shaft is being sunk on a narrow crevice, and at a depth of about 18 feet the diorite has become much more mineralized with pyrrhotite and copper pyrites. The Palo Alto is not being worked, but the San Joaquin shaft will be continued.

COST OF MINING.

The cost of labour and mine supplies is now about the same as found in other mining centres of the west. The following is the cost of labour—Miners, $3 to $3.50 per 8 and 10 hour shifts; trammers and top-men, $2 50 per 10 hours; engineers, $3.50 to $4 per 10 hours; timbermen and blacksmiths, $3.50 to $4 per 10 hours; foremen, $4 to $5 per day. The cost of driving tunnels or drifts depends much upon the nature of the rock; in exceptional places, where the ground is much broken, the cost is from $7 to $10 per foot; but in the solid, tough diorite, from $10.50 to $15.50 per foot. Shaft sinking depends upon the size, to some extent, but costs from $18 to $30 a foot. The price for timber, lumber, wood and other supplies, is now very reasonable.

I have the honour to be, Sir,
Your obedient servant,
WILLIAM A. CARLYLE,
Provincial Mineralogist.

August 8th, 1896.

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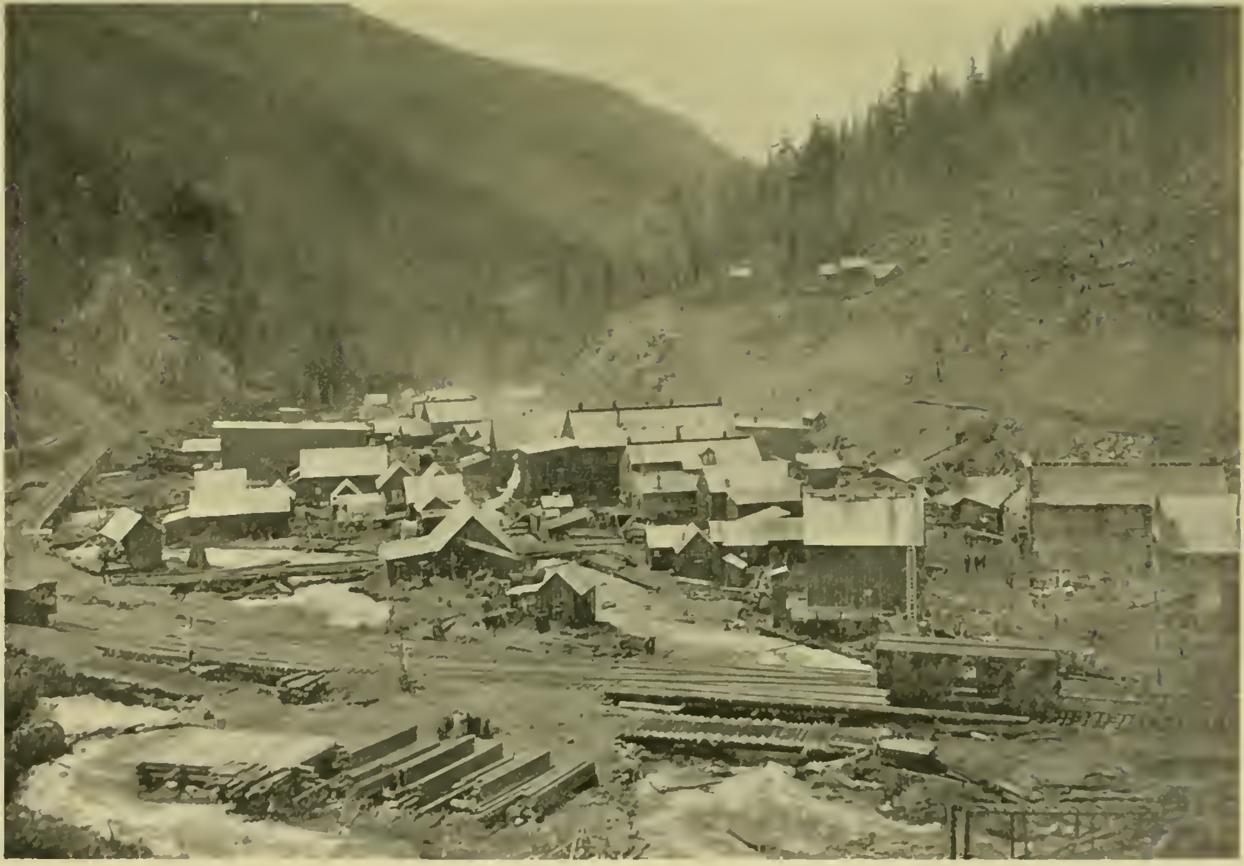


SANDON, SLOCAN M. DIV.

July, 1896, Showing the C. P. and K. and S. Railways.

REPORT

ON THE

SLOCAN, NELSON AND AINSWORTH MINING DISTRICTS

IN

WEST KOOTENAY, BRITISH COLUMBIA,

BY

WILLIAM A. CARLYLE,
Provincial Mineralogist.

BULLETIN No. 3.

By Authority.
JAMES BAKER,
Minister of Mines.

January, 1897.

For Reports and Information address
The Bureau of Mines,
Victoria, B. C.

REPORT.

To the Hon. Col. James Baker,
Minister of Mines, British Columbia.

Sir:—I beg leave to present, in Bulletin No. 3 of the Bureau of Mines, a description of the mines and mining industry in the Slocan, Nelson, and Ainsworth Mining Divisions of West Kooteney, from the examination of which I have lately returned. I wish to acknowledge again my indebtedness to the mining men for their continued assistance, by which I have been enabled to make this report of much more value, by reason of the fact that not only have I been able to examine many of the mining properties, but to have before me a copy of the smelter returns of nearly all the ore shipped from these districts, so that the values of the ore from the different mines herein given are known to be correct.

Every endeavour was made to visit as many as possible of the leading properties within the time available, but even then some important mines were not seen. In every direction new claims were being opened up, but, as seldom satisfactory information can be given concerning mere prospects, examination was mostly confined to these claims on which more or less work had been done, and on which underground conditions could be studied.

The fame of the large and unique gold-bearing deposits of Rossland has now spread far afield, with the result that during the past year the attention of mining men and capitalists from all parts of the world has been drawn to British Columbia, and many have been here and bought mining property, or will return next year to seek investment, for which this Province without peradventure now offers most favourable and advantageous opportunities.

The mining industry of British Columbia, it must be remembered, apart from the placer, gold and coal mining, is of very recent inception. Until eight or nine years ago the great extent of the mountainous country south of the Canadian Pacific Railway to the Boundary Line, was a wilderness known to few save the Indians and hunters, or the prospectors for gold diggings, but the finding of silver-copper ore on Toad Mountain, and the beginning of work on the silver-lead ore deposits on the east of Kootenay Lake, discovered many years ago by men in the Hudson Bay Company's employ, with the subsequent discovery among the mountains near by of other silver ledges, signalized the commencement of mining in Kootenay. But it was not until 1890-91 that these silver veins were beginning to attract mining men to this Province from abroad, and active operations were getting well under way despite the difficulties and great cost of bringing in supplies or transporting ore to the smelters, when all progress was for a time stopped and hope crushed by the sudden collapse in silver values, occasioned by the closing of the Indian mints to the free coinage of this metal.

Work, nevertheless, on some of the veins was persevered in, and in 1894 nearly $650,000 worth of silver ore was sent out of Kootenay. Then better means of communication were provided, and in 1895 the production of the different kinds of silver ore increased to over $1,000,000, which production has been doubled in 1896.

Meanwhile the gold-bearing pyrrhotite deposits on Trail Creek were being exploited under many vicissitudes, until the shipments of pay ore, in 1894, to the value of $75,000, and of nearly ten times this amount, in 1895, from the large ore bodies of the Le Roi and War Eagle, commanded wide-spread interest by reason of its being gold ore and very profitable, and in 1896 has been seen a great influx of capital's representatives and mining men, who are not only securing gold properties, but are investing in silver as well.

The production of the Kootenay mines, when compared with that of many of the mining centres in other countries, will not appear so very large to a casual reader, but when all the conditions are understood, that an entirely new country of large territorial extent is being rapidly opened up under difficulties, that the supply of needed capital, until recently, has been meagre, and that in reality not a single mine has had time to do sufficient development to put it on a really proper basis for extraction of ore and further exploratory work, this production will then be seen to indicate a most flourishing and hopeful condition of affairs.

As to the future there is now no doubt but that the number of paying mines and the mine out-put will steadily increase in the districts to be described, but not with that extravagant rate of increase predicted by some—at least not until those conditions exist that will permit the extraction of a much greater tonnage of ore. Such conditions are being supplied, and judging from the shipments already made in the new year, which exceed those of any previous year for the corresponding time, the out-put from Kootenay for 1897 will show a very substantial increase.

For some time back there has existed a strong antipathy to silver properties, and foreign investors especially have refused to entertain any proposition that was not on a gold basis, but now the fact is being realised that with silver even at its greatly reduced value, if there is a sufficient number of ounces of this white metal in the ore, a silver or silver-lead mine is quite as profitable and as desirable as a gold mine, and the handsome returns from the very high grade silver ores being mined in the districts to be described, are attracting increasing attention, as is testified by the numbers now seeking silver properties and the transactions recorded, as many mines or claims have been bought or bonded by English, American, and Canadian investors during the past season, not only within these districts but other parts of British Columbia.

The out-look for the coming year is especially bright, as many properties are beginning the new year with ore in sight, new mines have been added to the list, very promising prospects are being opened up, and during 1897 nearly every claim from which ore has been shipped in the past, will be on the list of shippers. There promises to be a steady increase in the amount of the ore extracted and sold, and in the amount of development done, but it is both unwise and hurtful to predict very large and sudden advances in the mineral out-put, as it must be remembered that a greatly increased out-put requires also a greatly increased amount of under-ground work, unless large bodies of very high grade ore are uncovered. Extravagant prophesies may travel far, and if the actual results do not approach the amount thus foretold, harm unjustly a mine or district, in which the progress has been most favourable and satisfactory, quite equal to the expectations of those best qualified to know.

These districts described in this bulletin, being essentially silver-bearing regions, suffered a severe set-back at the time of this disastrous fall in the price of silver in 1893. Nearly all work was suspended and it was only towards the end of 1894 that, taking new courage, work was recommenced with the result that a great increase in the production was evident in 1895, and progress has since been rapid and continuous.

The following is a short resumé concerning the three districts examined, further details and descriptions of the mines, &c., being appended.

THE SLOCAN.

The Slocan, according to the number of its shipping mines and the amount and value of the ore sold, now ranks as the most productive mining district in the Province, and in point of importance is not surpassed by any other.

In an area of fifteen by twenty-five miles, there have been discovered many veins of high grade silver-lead ore, which are being developed with great vigour and success, and among the mining men is every feeling of confidence and hopefulness. This winter nearly fifty of these properties are shipping high grade ore that yields very profitable returns, and a large number of other claims are being opened up.

So far but comparatively little imported capital has been expended here, as in the case of nearly every mine now established, sufficient money has been realised from ore extracted during development to pay for more extensive workings, new buildings, mills, trails, roads, and also dividends, but more or less capital will be required to properly open up many other claims on which the veins exist, but are not so easily accessable as those first discovered. But as most of these veins are found along the steep mountain sides and can be worked by tunnels, and the cost of mining is low, requiring little or no machinery, capital will be necessary mostly when tramways and concentrators are to be built, or in some cases for hoisting plants and pumps when tunnel sites may not be available.

Many of these mines are located near the summits of the high precipitous mountains at an elevation of 5,500 to 6,500 feet above sea level where erosion has cleared away nearly all débris from the veins, but lower down also on the mountain sides and in the valleys, are being found other veins or those discovered first much higher up, to the highest of which now run good trails or waggon roads or else wire rope tramways. The snow that lies deep on these summits during the winter is in nowise detrimental to mining operations, as most work is done after its fall, when the ore can be dragged down the smooth snow trails in rawhides in larger loads and at lower prices than are possible in the summer time, but the track of snow slides must be carefully avoided.

During 1896, 18,215 tons of ore yielded 2,141,088 ounces of silver and 19,210,666 pounds of lead, or an average of 117.4 ounces of silver per ton and 52.7 lead which would have a net profit of about $75 per ton, while many carloads were shipped that yielded from 300 to 400 ounces of silver per ton.

The "Slocan Star" has of course the largest shute of high grade ore yet found in this district, and we are kindly permitted to state that from 11,529 tons of ore and concentrates sold during the last three years, 912,600 ounces of silver and 13,482,000 lbs. of lead have been paid for by the smelters, and of these amounts 7,000 tons yielded 600,000 ounces of silver and 9,000,000 lbs. of lead during the past season of 1896.

Many of the veins are small, varying from 2 or 3 inches in width to 20 to 30 inches of solid ore, but the high value of silver at present makes this ore very profitable together with the low cost of breaking ground. The small Reco-Goodenough vein, the width of which is measured in inches, is probably the richest vein yet mined, as from the smelter returns of about 600 tons, the average was 407 ounces of silver per ton and 12 lead. The high percentage of lead makes this ore a very desirable one for the smelters, and the lead contents are usually sufficient to pay the freight and treatment charges, and the duty charged on the lead.

At no time in the history of this district have so many mines had high grade ore exposed, and of such mines can be named among others the Slocan Star, Ruth, Wonderful, Monitor, Idaho, Alamo, Cumberland, Ivanhoe, Queen Bess, Wild Goose, Payne Group, Slocan Boy, Washington, R. E. Lee, Last Chance, Noble Five Group, Reco, Goodenough, Blue Bird, Antoine, Surprise, Rambler, Best, Dardanelles, Northern Belle, Whitewater, Wellington, Charleston, Lucky Jim, London Hill, Reed and Tenderfoot, Fisher Maiden, Thompson Group, Galena Farm, Enterprise, Neepawa, Bondholder, Two Friends, Howard Fraction.

NELSON.

The Silver King silver-copper mine of the Hall Mines Co., Ltd., the Poorman gold (quartz) mine, and some small placer workings, have yielded all the production credited to this district, but other mines will be added ere long to this list. Since the completion of the smelter at Nelson there has been greatly increased activity at the mine of this Company.

The Silver King mine has now shipped 31,000 tons of ore that yielded 800,000 ounces of silver and 2,500,000 lbs. of copper, and the development of the property is rapidly being pushed, so as to permit of a greatly increased out-put, while the smelter is being increased so as to undertake the treatment of all classes of ore as may be bought in the market.

The Poorman gold mine has given up about $100,000 from its quartz ledge, and other properties in this locality that have similar veins are now under bond and will be worked.

The new district, known as the Salmon River Country, lying south of Nelson to the Boundary, and traversed by the Nelson and Fort Shepherd R. R. was not visited, but during the past year many claims were staked off on gold and silver leads on the ridges, between which run the tributaries of this river. This winter considerable work is being done here, and during the coming season much greater interest will be shown in these veins, in which it is stated, ore similar to that of Rossland, and also gold-silver quartz with galena and other sulphides have been discovered, assays of which have given high values. *See* short description below by Mr. McConnell.

AINSWORTH.

The out-put from Ainsworth for 1896 was much lowered by the cessation early in the year of mining on the Blue Bell, in which, it is reported, the ore has become rather low grade for present conditions, but in several of the other mines west of the town of Ainsworth, considerable progress was made.

The Skyline, Number One, Blue Bell, Highlander, Little Phil, Mile Point, Neosho, Sunlight and Tariff, shipped ore, much of which was the silvery "dry ore," and the remainder galena, which does not carry as much silver as the Slocan veins, but averages 30 to 40 ounces in the solid ore.

This district suffered especially in the decline of silver prices, but now vigorous prospecting is being done once more on both sides of the lake, and new mining enterprises are being inaugurated. The town of Kaslo, the eastern entrance to the Slocan, is growing rapidly, and steamers run daily to Nelson to connect with the railroads, while the only public sampling mill in Kootenay is here located.

Production.

In the following tables the tonnage is the net weight, *i. e.*, with the moisture in the ore, amounting from 1 to 6 % deducted.

(*b.*) The silver and gold are given in fine ounces, and represent the amount of each paid for by the smelter, or 95 % of the assay value.

(*c.*) The price of gold is estimated at $20 per ounce; of silver for 1895, 65.3 cents, and for 1896, 67 cents per ounce.

(*d.*) The lead is the total amount paid for by the smelters, or 90 % of the assay value, and the price the average of the New York quotations for the year, *i. e.*, for 1895, $3.23 per 100 lbs., and for 1896, $2.98 per 100 lbs.

(*e.*) The price of copper is estimated at 5 cents per lb., as paid by the smelters, but the price received for the matte from the Hall Mines Co. is not known.

(*f.*) This table represents the amount and value of the ore actually paid for, as per smelter returns received during the year.

(*g.*) The ton is 2,000 lbs.

SLOCAN.

	1895.		1896.	
	Amount.	Value.	Amount.	Value.
Gold, ozs.	6	$ 120	152	$ 3,040
Silver, "	1,137,040	742,487	2,141,088	1,434,529
Lead, lbs.	9,751,464	315,070	19,210,666	572,479
Total value	....	$1,057,677	....	$2,010,048

Total tonnage, ore and concentrates, 1895, 9,649; 1896, 18,215.
do number of mines that shipped in 1895, 30; 1896, 42.
do " miners at work in 1896, 1,000.

The number of mines shipping may be increased by adding some that have sent out very small lots of ore.

NELSON.

	1895.		1896.	
	Amount.	Value.	Amount.	Value.
Gold, ozs.	1,275	$25,500	511	$ 10,220
Silver, "	49,750	32,487	631,960	423,413
Copper, lbs.	112,420	5,621	2,237,921	111,896
Total value	....	$63,608	....	$545,529

Total tonnage—1895, 1,148 tons; 1896, 30,160 tons.
do number of mines producing—1895, 5; 1896, 4.
do " miners at work in 1896, about 350.

AINSWORTH.

	1895.		1896	
	Amount.	Value.	Amount.	Value.
Silver, ozs.	263,030	$171,759	187,279	$125,489
Lead, lbs.	6,724,000	217,185	2,151,000	64,100
Total value	....	$388,944	....	$189,589

Total number of mines shipping—1895, 8 ; 1896, 9.

Tonnage cannot be stated, as the number of tons mined at the Blue Bell Mine was not ascertained, but from the other mines in the district there were shipped:—

1895, 2,208 tons ; 1896, 1,664 tons.

Total number of miners at work, about 200.

The decrease in the amount and value of the ore shipped during 1896 is mostly due to the suspension of work on the Blue Bell.

AMOUNT OF ORE SHIPPED AS PER CUSTOMS RETURNS.

Upon the shipment of ore to the United States a declaration is made in the outward entry of the contents and value of the ore, but the duties are not collected upon this statement, the ore being shipped in bond to the smelters, and the duty charges determined from the smelter returns. There will be, necessarily, differences between these returns and those given above, in that in the declarations the exact values are not given, only the approximate ; and again, the above tables give the smelter returns *received* during the year, the customs returns give the amount of ore *shipped* during the year; hence, for most of the ore shipped in December the smelter returns coming back in January, the returns are credited to the year in which the smelter returns are received. The gross values were determined by calculating the value of each metal at its average price for the year. The tonnage includes the shipments of ore, concentrates, base bullion and matte.

SLOCAN.

Year.	Tons.	Silver.—ozs.	Lead.—lbs.	Gross Value.
1894	4,417	613,926	5,623,621	$ 572,350
1895	8,828	1,122,705	9,554,079	942,094
1896	17,975	2,316,561	17,778,384	2,085,445
Totals	31,220	4,053,192	32,956,084	$3,599,889

NELSON.

Year.	Tons.	Silver.—ozs.	Lead.—lbs.	Gross Value.
1894	810	95,083	218,451	$ 68,823
1895	348	49,759	112,420	38,120
1896	2,248	586,143	2,010,294	493,225
Totals	3,406	730,985	2,341,165	$600,168

AINSWORTH.

Year.	Tons.	Silver.—ozs.	Lead.—lbs.	Gross Value.
1894	131	23,621	38,902	$ 16,165
1895	13,938	261,904	6,612,025	384.677
1896	5,408	203,897	2,476,972	210,918
Totals	19,477	489.422	9,127,899	$611,760

Transportation.

Since the commencement of mining in this region the construction of new means of ingress and of transportation has quickly followed the discovery of ore-bearing districts, and the great material advantages of the fine wateways have been utilised in gaining access to the many points where mining is now begun. West Kootenay is singularly favoured by reason of the (*a*) the Columbia River and Arrow Lakes, (*b*) the Slocan Lake, and (*c*) Kootenay Lake and its arms, and of the comparatively easy passes for railways from one to another. Otherwise this very rugged and mountainous country would have presented great difficulties that would have retarded for a much longer time prospecting and mining, but now, however, none of the mines are any great distance from these highways, and readier access is being gained by the building of trails and waggon roads.

GOVERNMENT AID FOR TRAILS, ETC.

The Provincial Government has followed a plan of assisting, as far as possible, the building of roads and trails to the various new camps, and though it has been impossible to accede to all of the many requests for aid where so many new parts are being opened up by fresh discoveries in many different directions, still the assistance given has been valuable, and has aided materially in the opening up of the country. As the Government Agents, to whose judgment the determination and carrying on of this work is entrusted, are already fully employed by their other necessary duties, it would be a good policy in the matter of economy and more general satisfaction if men could be engaged to carefully examine the different claims for roads and trails and applications for water rights, and then to choose and lay out such as would be of service to the greatest number, and open the most country; such men to be familiar with this work and able to locate such lines of trails as would benefit the greatest number of mining claims, be suitable for the transport *down* of ore, and be extended as further claims are proved up. The present agents have done good work, but they are unable, with so much other work demanding constant attention, to give that personal oversight necessary. It may happen that by special representation a trail may be built to a single group of claims, while another district that would be much more benefited by the opening of a wider field, would be denied, or the trail or road would not be built to serve as a main outlet, but be deflected to favour some particular property, instead of being located so that many more claims could easily connect with it by other trails.

Well directed assistance in this line is money well spent, as the more accessable this country is made the more rapid will be its certain development, as not only are the prospectors and miners better able to reach their finds and to spend the slight capital many can command in actual work on their claims, adding so materially to their value if such work shows up favourably, but investors and men with capital able to more quickly and thoroughly develop these locations can reach and examine properties more expeditiously and with less difficulty. Now that special interest is aroused and capital is here seeking investment, the more the country is opened up the more rapid and substantial will be the advance.

COST OF ROADS AND TRAILS.

The cost of trail-building in most parts is not high, as only in some of the deeper valleys and gulches is there much heavy timber, and if carefully supervised should average from $80 to $125 a mile for a good ordinary mountain trail, and if possible there should always be a down-grade to facilitate the transport of ore by "rawhiding." In building roads an instrument should always be used, or otherwise, if trusting to the eye only, the results will not be of the best. Some of the very best roads travelled over this summer were thus properly laid out, such as the road up into the Washington and Best Basins, to the "Ruth" mine at Sandon and the Enterprise road up Ten Mile Creek. The cost of the mountain waggon road varies from $800 to $1,200 a mile, with a safe average of $1,000 per mile, complete.

In the winter time temporary trails and roads are often easily made when the snow has fallen to some considerable depth.

Means of Access and Transport.

West Kootenay is now easily entered from two directions, and almost any part important can now be reached with dispatch and comfort, an agreeable surprise to all entering the country for the first time. First—From the north, at Revelstoke, on the main transcontinental line of the Canadian Pacific Railway between Montreal, Winnipeg and Vancouver, on the Pacific Coast, a branch line runs down the Columbia River 32 miles to Arrowhead, at the north end of Upper Arrow Lake, whence (*a*) a small steamer runs up the north-east arm of Evansport, the port of entrance, to the Lardeau and Trout Lake Districts; (*b*) the large stern-wheel steamers of the Columbia and Kootenay Navigation Company, for which Company a large boat is being built at Nakusp, to be ready to go into commission next spring, as the traffic has grown quite beyond the capacity of the present equipment, runs as far south as Trail, connecting at Nakusp with a branch line of the C.P.R. into the Slocan, and at Robson with another branch of the same Company into Nelson, along the Kootenay River, and at Trail with the Columbia and Western to Rossland. Second—From the south, from Spokane, Wash., where direct connections are made from the main trunk lines of the Great Northern and Northern Pacific Railways to all parts of the United States, the Spokane Falls and Northern Railway runs north to Northport, a few miles south of the boundary line, whence (*a*) this road, known as the Nelson and Fort Sheppard Road, follows up the east bank to Waneta and Sayward, in Canadian territory, and thence across to Nelson, connecting directly with the Kootenay Lake steamers at a point 5 miles east of Nelson, whence the road switchbacks into the town; (*b*) from Northport another branch, or the Red Mountain Railway, crossing the Columbia by large ferries, runs to Rossland; (*c*) while daily steamers run up the river to Trail, from which point again Rossland is reached, or the steamers taken for Robson, Nakusp and Arrowhead, as detailed above.

C.P.R., Nakusp to Sandon.

This branch has a daily train each way. From Nakusp it is 28 miles to Roseberry, on Slocan Lake; 32 miles to New Denver; 37 miles to Three Forks; and 41 miles to Sandon.

C.P.R., Robson to Nelson.

A train will run both ways daily to connect with the steamboats on both Arrow and Kootenay Lakes.

Kaslo and Slocan Railway.

This road runs daily trains between Sandon and Cody, east to Kaslo, on Kootenay Lakes, stopping at points whence roads or trails lead directly to many of the Slocan mines.

Slocan Lake.

A large steamer will soon be running on this lake, as well as the small one now running daily between Roseberry, New Denver, Silverton, Brandon, Slocan City and any other point on the lake desired.

Kootenay Lake.

Three commodious and rapid steamers, the Kokanee, Alberta and International, run daily each way between Kaslo and Nelson, stopping at Ainsworth, Pilot Bay smelter, Balfour or other points along this route when called for. Other smaller boats traverse the lake from the upper end down as far south as Bonner's Ferry, stopping, among other places, at the terminals of the trails into East Kootenay. Generally, if required, a small steamer can be engaged to go to any point on these waters.

ASSISTANCE OF STEAMBOAT LINES.

On all these steamboat lines every endeavour is made to assist the prospectors, miners, etc., by willingly stopping at any point where signalled or requested to land or take on board men, pack animals, supplies, ore, etc., and this accommodation is simply invaluable. On the swift waters of the Columbia River, the very clever navigation exhibited there is admired by all travellers, as great skill and steady nerve are called for at several points along this river, especially in the season of low water when these boats have to contend, in going up stream, with a powerful current which, in the late autumn and winter seasons, compels the use of steel hawsers fastened to the bank or rocks and the steam capstan.

Large scows are used on the Columbia River line, being fastened directly in front of the steamers, and capable of carrying eight loaded railway cars, are used between Arrowhead and Robson, on which loads of 370 tons of coke for the Nelson smelter, loaded from the cars at Arrowhead, have been brought down this fall, but if necessary loaded cars can be thus transported from the main line of the C.P.R. on to these branch lines running in at Nakusp and Robson.

RISE AND FALL OF WATER.

The difference on these water-ways between the high and low water marks is great, or 12 to 15 feet, and the season of high water is during the months of July and August, when the hot weather causes the rapid melting of the snow on the ranges. As so much of the country is being cleared by forest fires, permitting the more rapid melting of the snow, the floods may be expected to be even higher, and every precaution must now be taken in any work or building along the water front to be well up beyond any possible height the waters may reach.

NEW RAILROAD LINES.

The demand for more railroad facilities is now great. The ultimate benefit to our country and Province of some new lines now projected, and their own financial success, are, in the judgment of many acquainted with conditions, assured. These new lines, while having engineering difficulties to overcome, should open up a large part of the southern part of British Columbia now lying practically dormant, and make not only possible the development of resourses now almost inaccessable and valueless, but known to exist, and the easy assembling at large smelting centres of the different classes of ores and fuels, but also the fostering of a large demand for agricultural produce, for which no better market can be found than in these mining centres.

Of the new lines projected there are:—(*a*) the Crow's-Nest Pass Railway, connecting with eastern lines, thence passing close by the deposits of coal in the Grow's-Nest Pass of large extent and fine coking qualities, through East Kootenay, with branch lines to the Kootenay River and along the west shore of Kootenay Lake to Nelson;

(*b*) A branch of the C.P.R from Slocan City to a point on the Robson and Nelson line:

(*c*) The extension of the line from Arrowhead into the Lardeau and Trout Lake districts to the head of Kootenay Lake:

(*d*.) The extension of the Columbia and Western R.R. from Trail, up the west bank of Columbia to a point opposite Robson, and thence west into the mining districts of the southern part of Yale:

(*e*.) A railroad from the Columbia River west, through the southern part of the Province, to a point on the Pacific Coast.

THE IMPORTANCE TO THE COAST CITIES OF THE MINING CENTRES.

This last proposed railroad should be of very great value to the coast cities of British Columbia, by making possible the speedy, prompt and direct dispatch of merchandise and mine supplies to the interior mining centres, which, it must be remembered, are extending westward and nearer to the proper-base for a large part of the supplies. These cities can reap great commercial benefits from this growing mining industry, but they must seek conditions that will put them upon an equal or better footing than their very aggressive competitors, for the business men of Eastern Canada and the North-West are now striving eagerly with the Americans for this large and growing traffic, and British Columbians should at once exert themselves to the utmost to secure the lion's share of the business within their own borders.

For the agriculturist or rancher there can be no better market than will be found in these mining centres, where there is a large consumption of all they can produce, and where the best is demanded and readily paid for.

Again, with good railroad facilities, the Coast will be a very favourable point for large smelting works, where can be assembled the different classes of inter-fluxing ores, iron and lime fluxes, and the coke, now being made at the Union Colleries at Comox, on Vancouver Island, which large and prosperous smelting works demand; and moreover the refined products, base, bullion and matte, by reason of the very low ocean freights, will be able to enter the other markets of the world, without paying the excessive duties now imposed when shipped across the line to the south.

England is the largest buyer of foreign lead, and much of this metal is imported into China, Japan, and other Asiatic ports, and Australia is exporting her desilverised lead to all of these buyers.

The Location of and Title to Mineral Claims.

The mineral lands are open to location by any person having a free miner's licence—cost $5 per year—but only one claim, 1500 feet square, can be staked off on a vein or ore deposit by one person, who must conform to the regulations of the Mineral Act. No vein or ore can be mined beyond the boundaries of such claim, *i. e.*, these locations have no extralateral rights except those claims located prior to 1892, on which the vein or deposit can be followed down on its dip beyond the side line.

Possessary rights are secured by doing $100 worth of work per year on the claim, or by paying this amount annually into the Treasury of the Province. When $500 worth of work has been done, the owner of the claim can then secure full title by asking for and securing a crown grant of this land, after which no annual assessment is required.

General Geology.

In regard to the geological formations and structure of the districts under discussion, only an outline will be now attempted, and for such details we are indebted for information to the "Report on West Kootenay, of 1889," by Dr. Geo. M. Dawson, and the "Summary Reports" of 1894-5, by Mr. R. G. McConnell, of the Dominion Geological Survey. During the present year, Mr. McConnell and Mr. J. McEvoy hope to publish a provisional map, showing the general disposition of the different main rock series from Kaslo south to the Boundary Line, including parts of the Nelson, Ainsworth, Slocan and Trail Creek Districts, and this map, with its accompanying report, will be a very useful and important source of information concerning this mining region, of which the boundaries of the known mineral-bearing areas are being so rapidly widened by the discovery of more ore bodies in both old and new localities.

It is of great interest, that in all of the geological series represented here, are veins or mineral deposits, especially of silver and silver-lead ores, and no longer are the prospectors limiting their researches to special formations or parts of these districts, but energetic prospecting is being done with successful results all over this part of West Kootenay. For a long time these men refused to enter the granite areas, until finally the discovery by some less skeptical of the silver-lead, and the gold-and-silver or "dry ore" veins on the water-sheds of Springer and Lemon Creeks, east of Slocan Lake, and the success of the Poorman gold mine near Nelson, led to a rush of men into the granite regions with gratifying results.

The success of the rich Rossland mines is causing the wide-spread prospecting of all the country in which occur the same geological formations, and following these up as far as Nelson, many locations have been made in the country drained by the tributary creeks of the Salmon River, and elsewhere in the area between Nelson and Rossland. In the Ainsworth District, on both sides of the lake, can be found men in search of mineral, and in fact, there is now very little of West Kootenay that is not being over-run by them, and the wave of prospecting is extending throughout the Province, so thoroughly has interest and faith in her latent mineral resources been aroused.

There is no reason why mineral should not be found in all of these formations here present or in any part of this region, unless it has so happened that the conditions have prevailed by which the mineral-bearing solutions have not had openings or fractures along which to ascend and deposit their burden of precious ores, either by filling up pre-existing cavities or by leaching into or impregnating the country rock with valuable minerals on one or both sides of the channel or crevice. The finding of rich veins of ore in either of the series, such as of silver-galena ore, points strongly to the fact that as depth is obtained in mining, the continuity of the pay-shutes is assured, the veins may be "in and out" as the miners term it, or have perfectly barren parts along the fissure, but more or less work will disclose other ore-shutes if this work is pushed ahead along this fracture in the rock which has permitted the passage of ore-bearing solutions and the formation of ore-bodies along it elsewhere.

FORMATIONS.

There is a very large area of granite which has been pushed up through the highly metamorphosed stratified rocks, altering them still more near the line of contact, but the boundaries and relations between these different series cannot well be given before the publication of the geological map. However, by means of extracts from the above mentioned reports, some idea may be given of the geology of each of the districts visited.

(A.) THE GRANITES.—Dr. Geo. M. Dawson's "Report in portion of West Kootenay, 1889," says:—

"A large part of the West Kootenay district is occupied by granites and granitoid rocks, the main area of which (so far as observed) includes the whole basin of the Lower Arrow Lake, and extends thence eastward nearly to Queen's Bay on Kootenay Lake. Besides this great granite area, there are several others of smaller dimensions, as indicated on the map, as well as numerous dykes and eruptions too small to be separately shown. It is, in fact, probable that about one-half of the entire region here reported upon is occupied by granite and granitoid rocks, the granites differ considerably in appearance and composition, and appear to be referable to at least two and probably to three distinct periods, though it is as yet impossible to define the respective areas of these. The granites which are supposed to be of the greatest age, were found in some places underlying the lowest beds of the gneisses and mica-schists or Shuswap series. They appear to be closely attached to this stratified series, if not connected with it in origin, and in texture and composition as seen in hand specimens, can often scarcely be distinguished from some of its homogeneous gneisses. They are generally rather fine-grained, and are believed to consist for the most part of muscovite-biotite granite, though much further investigation would be required before it can be asserted that this is their characteristic composition.

"The granites which, however, occupy by far the largest area, are of coarse texture, generally grey, passing to black in colour, and are characterised by black mica, with frequently much black hornblende. They may be described as a whole as hornblende granites, but occasionally pass into mica-syenite. In some localities they are not infrequently coarsely porphyritic with large twinned orthoclose feldspar crystals, while sphene is often present as an accessory mineral.

"*These granites are evidently intrusive and of later date than the stratified rocks, which are altered at contacts.*"

Mr. McConnell in the Summary Report of 1894, further writes about the eruptive rocks and granites:—

"The eruptive rocks of the district occupy wide areas and belong to several periods. The oldest, as far as ascertained, consists of a series of basic dykes cutting the Shuswap group, but now in many instances so altered and foliated by pressure and other causes that they have the appearance of constituent beds. They occupy, in some localities, a considerable portion of the area assigned to the Shuswap series. They are older than the overlying formations.

"Eruptive granite rocks, much younger than those referred to above, occupy the western part of the region, from about the north end of the Lower Arrow Lake south to Trail Creek and east to within a few miles of Kootenay Lake. They cover a continuous area of fully 2,000 square miles. Numerous bosses and dykes of granite and pegmatite also occur further to the east, along the borders of Kootenay Lake.

"The granites where examined, are usually grayish in colour, and coarse grained as a rule, and are often porphyritic. The principal constituents are feldspar, quartz, biotite and hornblende. The granites cut all the formations from the Shuswap series up to the Slocan slates, and are consequently younger than any of the stratified rocks of the district. A series of eruptive rocks still younger than the granites, is represented by diorites and diabase and uralite porphyrites. These rocks occupy a considerable area in the Trail Creek country, and are important, as they hold the principal lodes of that district. It is possible that some of the porphyritic rocks, so abundant in the Toad Mountain region, may belong to the same group.

DYKES.—"In addition to the main areas of eruptive rocks, numerous dykes, some of them connected with the main areas, others much younger, as they cut through everything, are met with in every part of the district.

(B.) "THE STRATIFIED ROCKS bordering this granite area, are irregular tilted at high angles, broken by numerous faults, and frequently overturned."

Dr. Dawson determined their thickness to be, taking a section at Ainsworth to be 23,200 feet, and he believes the Shuswap series to be Archaean, while those series above thi area, are evidently Palaeozic in age, and may yet be referred to various systems, including the Carboniferous, and extending downward to the Lower Cambrian. He also states that "the grey and greenish schistose rocks are essentially composed of altered volcanic material, and their present schistose character may probably be regarded as in the main, due to the enormous pressure to which they have been subjected during the movements of the earth's crust, which resulted in the uplift of the mountains of the region, and the extrusion of the great masses of granite here everywhere found. In these different stratified series no strong evidence of unconformability have been reported."

The series of stratified rocks may be quickly described in ascending order, *i. e.*, by beginning at the lowest series, the Shuswap.

(*a.*) THE SHUSWAP, or lowest series, probably of Archaean age, consists of gneisses, mica-schists, calcareous gneisses or calc-sheists, hornblendic schists, bedded diorites, crystalline limestones or marble, and nearly pure quartzites.

(*b.*) THE NISCONLITH series of dark calc-schist holding occasional bands of limestone and green schists.

(*c.*) THE KASLO SCHISTS comprising a series of greenish, probably mostly diabase schists, interbedded with some slates or dark argillites, and limestones.

(*d.*) THE SLOCAN SLATES or a series of dark shales and slates with limestones and calcareous quartzites.

It is to be remembered that only parts of these districts have been geologically examined as yet.

THE SLOCAN DIVISION.

In the "Summary Report" of 1894-95, Mr. McConnell says:

"The region between Slocan Lake and River and Kootenay Lake, particularly examined during the season (1895), is covered mainly by granite fringed on the north and east by a border of slates and schists, and is everywhere of a mountainous character. The granite mass, originally dome-shaped, has been carved by the drainage system of the region into bold, craggy mountains and mountain ranges, which culminate in a rugged mass of snow-clad peaks, situated between the south end of Slocan Lake and Ainsworth, the highest summits of which approximate 9,000 feet in height above the sea. The principal streams of the district, including Lemon Creek, Ten-Mile Creek (Slocan Lake), the south fork of Kaslo Creek, Woodbury Creek, and Coffee Creek, radiate from this group and descend rapidly through deep, steep-sided valleys to the main waterways. A second range of prominent peaks, scarcely inferior in height to the central group, occurs north of the Kaslo-Slocan Railroad. The Whitewater, Lyell Creek, and other tributaries of Kaslo Creek, head in glaciers which descend from this range.

"The principal geological boundary in the district between Slocan Lake and River and Kootenay Lake is the sinuous line separating the granite area from the bordering slates. Starting from Four-Mile Creek, on Slocan Lake (at Silverton), this line follows that stream in an easterly direction for ten miles, then bends to the north across the range separating Four-Mile Creek from Cody Creek, and following the latter stream in a northerly direction for a couple of miles. From Cody Creek the granite border runs almost directly east of Twelve-Mile Creek; after crossing this creek the line becomes more irregular, as several spurs leave the granite area and penetrate for varying distances the group of mountains lying between Ten-Mile Creek and the south fork of Kaslo Creek. At the latter stream the granite recedes a couple of miles, then bends around a deep embayment of slates, and continues on in an easterly direction towards Kootenay Lake. Four miles from the Lake (now in the Ainsworth Division) the line of junction turns abruptly southward, and continues in this direction until near Balfour, where it bends more to the west and crosses the outlet of Kootenay Lake, about four miles below its head. Inliers of slate in the granite occur at the head of Eight-Mile Creek (Slocan Lake), on Four-Mile Creek, and at other places, while bosses of granite, separated from the main area, break through the slates at Paddy's Peak, Reco Mountain, and north-east of New Denver.

"The upper series of stratified rocks, consisting mostly of dark, evenly bedded slates, with some limestones, is largely developed in the Slocan Country, and is well shown along the Kaslo waggon road from Fifteen-Mile House westward, to a point a couple of miles west of

Three Forks, where this series is cut off by an area of eruptive rocks. Southward the slates of this series strike into the great granite mass which occupies the central part of the district, and are all cut off, with the exception of a narrow strip which skirts the granite on the east, as far south as the west area of Kootenay Lake."

AINSWORTH DIVISION.

"The Shuswap series occupies the basin of the Kootenay Lake, from Kaslo south for at least 40 miles. It borders both shores of the lake in bands varying in width from one to two miles or more. The strike north of Balfour is nearly north and south, but south of the west arm of Kootenay Lake it trends more to the west. The dip is almost invariably to the west, except where overturns have taken place.

"The series of green schists, dark argillites and limestones which overlies the Shuswap rocks, is well exposed along the waggon road from Kaslo to Three Forks. The green schist and associated rocks extend southward with a gradually diminishing width to a point on the west area of Kootenay Lake, two miles west of Balfour, where they are nearly, or altogether, cut off by the granite. Southward from this point, about four miles east of the Ymir Mountains two bands of argillites interbedded with crystalline limestones occur, which probably belong to the same formation."

East of the lake the Shuswap series, extending to the summit of the range, is developed on a grand scale, while from the Town of Ainsworth westward each of the series is represented, the "Number One" and "Skyline" mines being in the narrow border of Slocan Slates Series along the eastern limits of the granite border, as described above.

NELSON DIVISION.

The granite area is much developed here, but a band of the green schists (Summary Report, 1894), beginning near Ward's Ferry on the Kootenay River, strikes eastward across Toad Mountain to the head of the Salmon River, then down the valley of this stream. The distribution of this band assumes the form of a bay of stratified rocks opening to the south, and extending down through the Trail Creek District, with areas of uralite porphyrite and other eruptive rocks, and penetrating towards the north, the central granitic area of the district.

On Toad Mountain, the green and grey very schistose rocks (Kaslo Schists series?), in which is the Silver King lode, are believed by Dr. Dawson "to be stratified volcanic material of Palaeozoic age," and to consist in the most part of diabases and diabase porphyrites, and on the east are underlain by the gneiss of the Shuswap series, and overlain on the west near Red Mountain by reddish weathering slates.

Corrections.

In bulletin No. 2, the Report on Trail Creek Mining Division, the following errors were made:—

(*a.*) The capital stock of the Commander Mining and Smelting Co., Spokane, Pres. W. J. Harris, was stated to be $1,000,00 in $1 shares, instead of $500,000.

(*b.*) The Palo Alto Mining Company is registered at Victoria, B. C., and not at Spokane. Pres., L. F. Solly; Sec., C. Dubois Mason, Victoria; Managing Director, W. G. Estep, are the new officers elected last August 3rd.

The Slocan Mining Division.

THE ORE AND ORE DEPOSITS.

There are four distinct kinds of veins in the Slocan:—

1. The *argentiferous galena*, with zinc blend, and some grey-copper in a gangue or matrix of quartz and spathic iron. These veins cut across the stratified rocks, and *through* the dykes of eruptive rock, where, in many cases, there is a good body of ore, and they also occur in the granite area, and with even the limited amonnt of prospecting, some have been traced from 3 to 4,000 feet along the strike, and one for nearly 2 miles. In the Slocan slates, it has not yet been proven, that as the vein cuts through shales, slates, limestones or quartzites, that any one of the series has been more favourable to the formation of ore-bodies than another, as in the different veins it will be seen that good ore shutes may have the wall of any of these rocks mentioned. The ore has been deposited along fissures, both in the open fissure cavities, and

by impregnation of the country rock, and in the cavity-filled veins can be seen the banded structure described elsewhere, or the solid, usually big cubed galena, shows lines of foliation parallel with the walls, but it is evident that further motion has occurred along some of these vein fissures, after ore has been deposited.

Most of the veins are narrow, varying from 2 and 3 inches, to 15 and 20 inches in width, with occasional widenings to 3 or 4 feet of solid ore, and even much more, as seen in the Slocan Star and the Alamo-Idaho veins. The ore shutes are not persistent horizontally, as is characteristic of nearly all veins, but ore is often continuous for several hundred feet, and where it then pinches, a thin streak of oxides is the index usually followed in the search for more ore, which seldom fails to re-appear with more or less work. The mistake is made sometimes of following along a slip-wall or crevice that may cross the vein crevice at a flat angle, and thus lead the miner astray. Besides the solid ore, some veins have associated with them 2, 3 or more feet of mixed ore, gangue and country rock, or a brecciated mass, which may be of such grade as to pay well for concentration; and already there are three concentrators, the Alamo, Slocan Star and Washington, doing very satisfactory work, and the Noble Five mill almost completed, with the erection of two, at least, contemplated this year. The product or concentrates is silver-bearing galena, but any value contained in the decomposed material that may enter the mill, will in all probability not be saved, likewise, that in much of the grey copper, which apparently slimes badly and escapes.

The ore is shipped as "crude," or the solid or unaltered sulphides, or as "carbonates," *i.e.*, the decomposed ore, consisting of oxides and carbonates of iron, lead and silver, the mass having a reddish-brown colour, with more or less yellow material; those carbonates with a soft, velvety feel, assaying highest in silver. All material about these veins should be carefully assayed before being relegated to the waste-dump, where good ore, unsuspected, has already been thrown, especially soft, iron-stained decomposed rock or vein matter.

GOLD.—It might be well to be on the lookout for gold, remembering the good gold values found in the galena ores of the Monitor mine, which yield from $2 to $14 in gold per ton; one lot of 20 tons of crude ore assaying $20 per ton in gold, while the "carbonates" average $13, the smelter paying for all gold above $2, or one-tenth of an ounce. The "carbonates" seldom are as high grade in silver as the unaltered, or crude ore in the vein, but in some mines this class of ore is very valuable.

While most of the veins are not wide, the richness of their ores greatly compensates, as may be seen from the lead and silver values as *per smelter returns* from a few of the mines as:—

Slocan Star	80 to 95	ozs. silver per ton,	70 to 75 % lead.
Reco	83 to 730	" "	19 to 67 "
Good-enough	167 to 507	" "	15 to 67 % "
Noble Five	62 to 543	" "	30 to 75 % "
Last Chance	135 to 238	" "	35 to 78 % "
Wonderful	113 to 133	" "	70 to 76 % "
Ruth	40 to 125	" "	15 to 73 "
Monitor	142 to 367	" "	32 to 57 % "
Wellington	125 to 328	" "	10 to 55 "
Whitewater	72 to 326	" "	10 to 65 "
Dardanelles	149 to 470	" "	15 to 55 "
Enterprise	155 to 180	" "	18 to 30 "
Two Friends	248 to 380	" "	38 to 52 "
etc.,	etc.,	etc.,	etc.

The other Slocan mines have ore of the same character and high grade, as may be seen in detailed accounts below. The lowest values in the above indicate the lowest smelter returns on ore that is classed as "carbonates." The average value of all the ore sold has been given above.

ZINC.—In most of these veins the zinc blende carries a small silver value and is sorted or concentrated out of the ore, so that vary little ore sent to the smelters has over 10 zinc limit. But in the "Enterprise" mine, on Ten-Mile Creek, the best silver assays are said to be got from the zinc blende, which is much more valuable than the galena. As is to be expected, small lots of very rich ore are mined, lots that will yield from one to two thousand ounces per ton, but the average figues already given will indicate the importance of these veins that are now being mined in both the granite and stratified rocks of this district.

2. The veins of *argentiferous tetrahedrite* or grey copper and jamesonite and silver compounds in a quartz gangue.

These veins can be seen in the granite exposure on the "Best" and "Rambler" mines, and in the stratified rocks on the "London Hill" property, from which very high grade ore has been shipped.

3. The "*dry ore*" *veins* on Springer and Lemon Creeks, in the granite, with a quartz gangue containing argentite, native silver, and gold.

These veins are now attracting much attention, as high assay returns have been secured as per smelter returns; sorted ore of this character from the Howard fraction yielding 163 to to 206 ounces of silver per ton, and $16 to $26 per ton in gold.

The "Chapleau" recently received the smelter returns on four tons of sorted ore, from which 3.6 ounces of gold and 94.7 ounces of silver per ton were returned, netting to the owners $102 per ton after deducting freight and treatment charges.

4. The *gold-quartz veins* in the southern part of the granite, such as those reported to be on the Alpine group.

The values and characteristics of the last three mentioned classes of vein will be better known later on, as the work now begun yields results and information.

Costs.

Mining.—(*a.*) The cost of driving tunnels and drifts varies from $3 to $9 per foot in stratified rocks, and from $7 to $10 in the granite:

(*b.*) The cost of sinking shafts from $12 to $20, but so far little work of this kind has been done:

(*c.*) The cost of stoping cannot be ascertained, but the following table, compiled by Edmund B. Kirby, M. E., and given in a paper to the Colorado Scientific Society, December 3rd, 1894, from experience gained in Colorado, where nearly similar conditions and cost of labour, supplies, etc., obtain, may be of value:—

Approximate Yield and Cost of Stoping per ton of ore broken.

Thickness of Pay-streak. Calculated for ore when 13 cubic feet = 1 ton.	Tons per square fathom of ore sheet.	Cost of stoping per ton.
A streak 4 inches wide yields	0.92	$17.33
" 6 " "	1.38	11.55
" 8 " "	1.85	8.67
" 10 " "	2.31	6.93
" 12 " "	2.77	5.78
" 14 " "	3.23	4.95

(*d.*) For labour the average paid miners is $3 50 for 10 hours, or $3 for 8 hours; timbermen, $3.50 for 10 hours; shift bosses, $4 to $5 a day; blacksmiths, $3.50 to $4 per 10 hours; trammers and topmen, $2.50 to $3 for 10 hours:

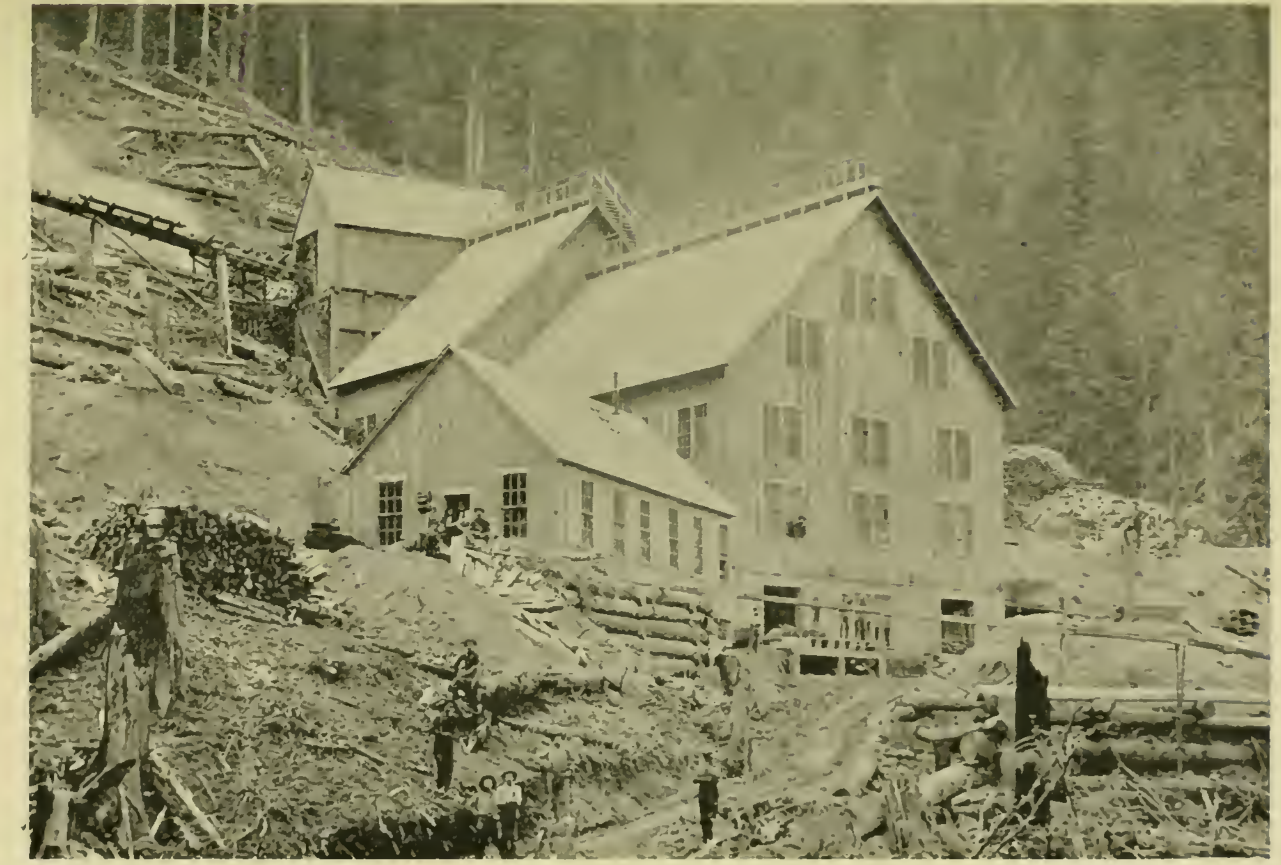
(*e.*) For supplies, No. 1 giant powder costs about 18 to 22 cents a lb.; No. 2, $9 per 50 lb. box; drill steel, 16 cents a lb.; candles, $7 a 40 lb. box; cordwood, $1.50 to $2.50 at the mine; rough timber, $11.50 to $12.50 per M. The cost of food and other supplies is now very reasonable.

Transportation.—(*a.*) The cost of packing down ore on horses in the summer time varies from $5 to $8.50 per ton to railroad. In the winter time, by rawhiding, $2.50 to $3.50 per ton:

(*b.*) By waggons or sleighs, $1 to $2.50 per ton:

(*c.*) Cost of transportation from shipping centres to the smelters in the United States, from Sandon, $7.50; from Slocan City, $11.00.

Treatment.—The treatment charges depend upon whether the ore is crude or "carbonates," and on the latter according to the percentage of lead. On the crude ore, or nearly pure galena, the smelter charges vary from $15.50 to $18 per ton; on the carbonates from $9 to $15 per ton; the $9 rate being given in one case where the lead did not exceed 20%.



SLOCAN STAR CONCENTRATOR.

(See page 51, Bulletin No. 3.)

The smelters pay for 95% of the silver and 90% of lead, assay values, at the New York quotations at time of settlement.

For zinc, 50 cents is charged per unit — about 10%. The duty on lead in the ore entering the United States is ¾ of a cent per lb.

DESCRIPTION OF CLAIMS.

In describing the mining properties the following grouping has been followed. Beginning at Sandon, on the south fork of Carpenter Creek, now the distributing and main shipping centre in the Slocan, where recently the Bank of British Columbia and the Bank of British North America have opened offices:—

(*a.*) The mines and claims on the mountain range south of the creek are the Slocan Star, Ruth, Wonderful, Canadian, and Adam's groups, Ivanhoe, Yakima, Alamo, Idaho, Cumberland, Queen Bess, Monitor, and adjacent claims:

(*b.*) The mines and claims on the south slope of the mountain range running east and west, north of the creek, as Lucky Jim, Payne, Slocan Boy, R. E. Lee, Last Chance, Noble Five, American Boy, Reco, Goodenough, Blue Bird, &c., with the claims in the basins on the north slope as Northern Belle, Dardanelles, Rambler, Best, Surprise, Antoine, Washington, &c.:

(*c.*) The mines and claims north of the K. & S. R. R., as the Whitewater, Wellington, London Hill, &c.:

(*d.*) The mines and claims on the creeks tributary to Slocan Lake:

(*e.*) Claims on Cariboo Creek and its tributaries.

SLOCAN STAR.

This property has not only paid a larger amount of dividends, or $300,000, than any other mine in British Columbia, apart from the coal and placer mines, but has proved itself to be the largest silver-lead mine so far developed in the Province. It was discovered October 17th, 1891, by one of the present owners, Mr. Bruce White, and others, who, following up Sandon Creek, discovered in the bed of this stream, a mile above its junction with the south fork of Carpenter Creek, the site of the Town of Sandon, a vein 13 feet wide, of quartz and spathic iron interspersed with galena, zinc blende, and angular pieces of the slate country rock. Prospecting to the west in a dense forest of heavy timber along the strike of the vein, at about 800 feet, a large exposure of the surface croppings of the large ore-shute was found, and here the Slocan Star claim has developed the ore-body to be described below.

This group of claims, all Crown Granted or Crown Grants applied for, comprises the *Slocan Star*, *Slocan King*, *Silversmith*, *La Plunta*, *Windsor*, *Shogo*, *Emma*, and *Jennie*, of which the Slocan Star, Slocan King, and Silversmith, apex claims, are located along the trend of the vein for about 4,000 feet. It is owned by the Byron N. White Co., Pres., Angus Smith, Milwaukee, Wis.; Gen. Manager, Byron N. White; Superintendent, Bruce White, Sandon. Capital stock of the company 1,000,000 shares at 50 cents each.

ORE-BODY.—This vein cuts across the steep, heavily timbered mountain side and nearly at right angles to the well stratified slates, quartzites and silicious limestones of the Slocan slate series, with an east and west strike and a dip of 54° to the south. While this vein has been traced through and beyond this property into other claims, it has not yet been traced continuously, nor has it any constant width, varying from a width of a few feet to 20 or 30 feet, with in other places no signs of mineralization at all along the fissure along which the country rock has been more or less shattered and the ascending mineral-bearing solutions have formed large deposits or shutes of fine ore. A large porphyry dyke runs nearly parallel with the vein and in places in the mine is found in it, but evidently affected by this fissure.

Along this fissure is seen much brecciated slate cemented together by the gangue materials, galena and blende, and in many other parts of the mine was noticed more or less parallelism in the deposition of the different minerals; but one interesting peculiarity noticed was the fact that many samples of ore clearly showed by the separation by the quartz of corresponding parts that the sulphides, as galena or blende, after deposition, had been shattered, perhaps, by further movement along this line of break, and then cemented into the present mass by quartz.

It is doubtful if two well-defined walls can be traced in this mine, for while the hanging or fissure wall is very distinct, the ore merges into the country rock towards the supposed foot-wall, but more time could not be spent in very careful observation. In the mining of this one large ore shute as has been opened up and exploited upon the Slocan Star, the ore body has been found to vary from a few feet to 25 feet in width of mixed but pay ore, and a large amount of ore has been mined from bodies 2 to 8 and 10 feet wide of solid galena.

Ore.—(*a*) The first-class ore consists of the nearly pure galena, both fine and coarse-grained, carrying some grey copper and some blende, but not enough to pass the excess line, or 10% of zinc. Average value, 95 ozs. silver per ton, 72 to 75% lead.

This ore is sacked and shipped direct to the smelters.

(*b*) The concentrating ore consists of the mixed ore or the spathic iron quartz gangue with galena, with a little grey copper, and in all the ore there are evidently some of the silver sulphides. The large amount of mixed ore taken from the upper workings and kept separate became available on the construction of the concentrator, and was being sent down the hill. In concentrating most of the blende is removed so that the concentrates carry not more than 6% zinc. Average value of concentrates, 80 ozs. silver per ton, 70% lead.

The Mine.—This main ore shute has been developed for a distance of 430 feet along the vein and to a depth of nearly 350 feet from the surface down on the dip, and from it several small bodies of ore have formed along divergent crevices.

Tunnel No. 1 was first run into the large surface exposure for 50 feet and then stopes were run to the surface or 30 feet.

Tunnel No. 2 is a cross-cut for 100 feet, and then a drift for 100 feet, with a stope up to No. 1 80 feet long and 4 to 10 feet wide.

Tunnel No. 3 is 70 feet below No. 2, and in cross-cutting at 70 feet, intersecting a leader of ore drifted upon for 25 feet, and then passing through the slates, more or less mineralized, cut the main lead at 150 feet. A drift 150 feet to the west, through low-grade ore, entered a splendid body of high-grade ore which, on being stoped back 110 feet to the east, had led back to within a few feet of connecting with the short drift run at a 70-foot mark in the tunnel, thus leaving a pillar nearly 40 feet wide of what promises to be low grade, but paying, concentrating ore. This stope is now 180 feet long and 4 to 7 feet wide, and is worked up for most of the distance to the upper level, while the drift has a total length of 430 feet along most of which is much concentrating ore. But this shute has developed its largest and most productive ore body between the level and No. 4, below which no work will be done until Tunnel No. 5 reaches the ledge.

Tunnel No. 4 was the main working entry at the time of visit, and here were erected the ore-bins at the upper terminal of the gravity tramway to the concentrator. At a distance of 575 feet this tunnel entered the vein, where it was 10 to 12 feet wide, and to the west a drift of 75 feet long had encountered a fault which had not been explored, but up along which a stope had been extended a short distance in, 8 to 10 feet of mixed ore. Easterly from the tunnel, at 100 feet, an up-raise had been made 210 feet to the next level, and all the way in good but mixed ore, with 14 to 16 feet of concentrating ore at the foot or tunnel level. At 150 feet in this east level a cross-cut showed up a width of over 25 feet of mixed ore with several feet of solid galena, but at the face, or 225 feet, the shute was then narrowed to 3 feet. A large amount of stoping has been done for 70 or 80 feet below level No. 3, where the body of clean ore had been 8 to 10 feet thick, but a large amount of ore was still showing in all the limits af these stopes.

Tunnel No. 5 was in 200 feet in the slates, with 600 feet remaining to reach the vein 210 feet on the dip below level No. 4. The ground was all ready for the building and air-compressor plant, *i. e.*, 4-drill Rand and an 80-horse-power boiler, and rapid progress would be made with the machine drills in the extended exploration of this claim, along this level.

On the "Silver King" to the east, near the vein exposure in the creek, a tunnel had been driven in 80 feet, but although there was considerable ore for some of the distance, the ground was much broken up. To the west, on the "Silversmith," ore was exposed in some shallow cuts, but this claim has in reality been but very little prospected.

Timber and Water are abundant for mining purposes the timber being of large size, and immediately at the mine, where the stopes are timbered up with heavy stulls and lagging.

Transportation.—A steep waggon road from Sandon climbs up past the mill to tunnel Nos. 3, 4 and 5, but all ore is sent down to the mill by the 3-rail gravity tramway, about 1,600 feet long, covered where necessary by snow-sheds, the concentrating ore being automatically dumped into the mill bins, the sacked first-class ore being loaded into ore waggons or sleighs, and drawn, also the concentrates, ½ mile to the railroad at Sandon, at a cost of 80 cents per ton. Number of men employed 83, of which 55 were in the mine, and 10 at the mill.

The Concentrator.

This mill, designed and constructed by Mr. T. L. Mitchell, Sandon, who built the Washington Mine Concentrator, and is now completing the mill for the Noble Five Mining Co., is situated at the foot of the tramway, and is 16 by 102 feet, with four floors.

Bins.—There are two 150 tons capacity each, one for the coarse ore from the mine, the other for crushed ore below the crusher for supply.

Power.—(*a.*) A Pelton wheel, a 3 foot steel disk, with a $1\frac{7}{8}$ in. nozzle, supplies, when the water is sufficient, ample power, and is situated on the upper floor, so that the water from it, after going through a 12 mesh screen, may be used for washing in the operation of the mill.

(*b.*) When water is scarce, an auxiliary steam engine will be used, or a 10 h. p. engine, with a 50 h. p. boiler.

Water.—(*a.*) A flume 3,000 feet long in two branches, brings from Sandon and another small stream, water that flows down through 1,200 feet of spiral rivetted steel pipe, the lower 250 feet 7 in. in diameter, with a total head of 171 feet at the wheel. (*b.*) Another flume from Cody Creek, 9,650 feet long, 2 x 2 feet, on a 0.2 grade, costing $7,400, now supplies water for washing purposes in the mine, but has no head for power.

Machinery was made by E. P. Allis & Co, Milwaukee, much after Mr. Mitchell's designs, and comprises :—

(*a.*) A Blake crusher, Reliance pattern, 9 by 15 inches :

(*b.*) Four sets of rolls, Reliance pattern, 14 by 26 inches :

(c.) Six Hartz jigs, *i. e.*, 2 double 2-compartment, and 1 double 3 compartment jigs :

(*d.*) Six 2-compartment Collum jigs :

(*e.*) Elevators, trommels, classifiers and settling tanks, etc.:

(*f.*) Two double-decked round slime tables, 18 feet diameter.

Method of Concentration.—The ore from the crusher is automatically fed by a cam-feeder to 2 sets of coarse rolls, whence the material is elevated by elevator No. 1, into one revolving screen with 3 sizes of screens, from which (*a*) the refusal of the screens passes to 2 coarse Hartz jigs ; (*b*) the material from the 16 m.m. (.64 in.) screen, to 2 coarse Hartz jigs ; (c) the material from the 7 m.m. (.28 in) screen, to 2 coarse Hartz jigs ; (*d*) the material from the 3 m.m. (.12 in.) screen, passes to 2 three-compartment hydraulic classifiers, which give 3 separations, each of which goes to two of the double-compartment Collum jigs, while the overflow passes on to the V-shaped settling tanks, or species of spitz-kasten, from which each of the four sizes of fine stuff goes to its own slime table.

The pitch of each slime table is different, so as to conform to the size of the fine sand fed to it, and by using two water sprays, 3 separations are here made, the heads, middlings and tails, of which the middlings pass back by elevator No. 2, to the hydraulic classifiers.

The middlings from four coarse jigs pass to the coarse set of middlings rolls, and thence back to elevator No. 1, the 7 m.m. middlings to middlings rolls, and thence to elevator No. 2, while the fine middlings from six Collum jigs, go to fine middlings rolls, which discharge into elevator No. 2. The automatic discharge material from six coarse jigs, and the sieve work from the six Collum jigs, and the heads from the tables, pass by the concentrate sluices to the concentrator bins below, whence they are shoveled into sacks of 155 lbs. to 160 each, while the over-flow, carrying much fine material, goes into the settling tanks in the slime house.

Capacity of Mill is up to 150 tons of ore per 24 hours, the ratio of the concentration varying, of course, with the grade of the ore sent down from the mine.

The mill has worked excellently from the start and is giving great satisfaction The product is very clean galena, with seldom over 6 , and never up to 10 , of zinc, but there is a considerable loss of silver, some of which is carried away in the blende, while the greatest source of loss is believed to be in the grey copper, much of which escapes in the finest slimes.

Cost was, for buildings, $12,700; for machinery, not including engine and boiler, $17,000.

Other claims.—To the east considerable work by tunneling has been done on the *Eureka* claim, which lies up on the steep mountain side along which this vein, by the angle of its dip, would be expected to run. Between 60 and 70 tons of ore have been shipped during 1894-5-6.

The *Rabbit Paw*, lying to the south and west, is being prospected by a company who are searching for its extension westward of the vein.

RUTH.

This group of claims, the *Ruth*, *Hope*, *Wyoming*, and the *Ruth Fraction*, all surveyed for Crown grants, are located on the same mountain side, one-half mile from the Slocan Star and one and one-quarter miles by road from Sandon, and was owned by the locators, F. P. O'Neil, D. C. Clark, J. Y. Kesler, F. E. Starkey, D. E. McVey, and W. H. McVey until last October, when two-thirds interest in this property was sold for $166,000 to Mr. H. M. Foster, England, Messrs. D. E. and W. H. McVey retaining their one-third interest.

After many hardships and disappointments, but persistent prospecting, the Ruth vein was accidentally disclosed by a small piece or two of iron-stained rock sticking in the roots of a wind-fallen tree that had stood nearly on the top of the ledge, and even then considerable work had to be done before the ore shute was struck from which has since come the mine's production. Under the direction of the foreman, D. S. McDougal, this property has been prospected in a systematic manner, and all the work has been done with care and thoroughness, which has greatly enhanced its market value, as is evidenced by the recent transfer at such good terms.

The vein dipping N. W. 60°-90° strikes across the slates N. E. by S. W., and carries in the gangue of spathic iron and some quartz very coarsely crystalline galena, that runs from 100 to 120 ounces in silver per ton and 54 to 76 % lead, while within surface influences the sulphides have been changed to the "carbonates," that run from 30 to 65 ounces of silver per ton, of both of which classes of ore 1,500 tons have been sent to the smelters. The width varies, but in one drift the shute was seen to be at one part 9 feet wide, but as far as the vein was opened up, or 800 feet, it was very persistent and regular in its course, the fault dislocations being small. The ore is always banded parallel, of course, with the walls, and in the upper workings bands of galena have bands of the oxidized ore on either side, or there were in the other parts alternate bands of spathic iron, galena, and blende.

THE MINE.—*Tunnel* No. 1 follows the vein or vein crevice for 350 feet, but the ore shute is not reached by it, it not being far enough into the mountain to be under the ore mined in the tunnels above.

Tunnel No. 2 was 740 feet long (Aug 16th), but for 90 feet but little ore was found, or 11 tons, but beyond this the vein, though small, is more defined, until 150 feet in, where a stope 160 feet long begins, and runs up 40 feet, with an average width of 3-3½ feet, with ore still in the roof. An upraise of 85 feet connects with tunnel No. 3. Farther in was another stope 55 feet long and up 30 feet, showing at the top 4½ feet of banded ore or galena, spathic iron, and "carbonates." Still another stope 160 feet long, 3½-4 feet wide, was up about 40 feet with ore in the roof, while beyond this in the tunnel level there was a width of 8 feet of first-class ore for a length of 25 feet, and at 630 feet an 80 foot upraise, also in ore. In the breast of the tunnel the vein was passing through a porphyry dyke, but only as a narrow seam of ore.

TUNNEL NO. 3 was 330 feet long with ore all this distance, but not so wide as below, although at the face were 3 feet of galena and decomposed ore or "carbonates." As the ground was soft all the tunnels were timbered up in an excellent manner and every part of the mine was in the best of order, and there is much good timber on the property. A waggon road 6,600 feet long had just been completed at a cost of $1,575, thus giving easy facilities for the shipment of ore to the railways. Number of men employed 25.

WONDERFUL.

The *Wonderful*, 34.50 acres, Crown Grant, and the *Lookout*, and *Columbus* mineral locations, situated on the mountain slope about one mile west of the Ruth and Slocan Star, and south of the branch of Carpenter Creek, is owned by the Wonderful Group Mining Co., of Spokane, Pres., W. W. D. Turner; Sec., H. G. Bell, Spokane. Capital stock $1,000,000 in $1 shares. Superintendent, E. J. Field, Sandon.

The mining operations conducted during the last season on the Wonderful, were rather unique. The property had been under bond to Jno. A. Finch, who had done over 2,000 feet of underground work, mostly along the supposed course of a vein, but with not very successful results, only two carloads of ore being shipped from these workings in 1895. Ore was found scattered through the wash and the much shattered slates near the surface, so the company decided to prospect the claim by bringing water from one of the small streams in a small flume and then letting it cut its way down through the wash to bed-rock as it rushed down the mountain side to Miller Creek. Water was turned on June 18th, and it was found that pieces of galena ore were being left in the bottom of the cut, and this prospecting then developed into hydraulic mining, the water being allowed to run for several hours, when there would be a "clean up" of tons of high grade ore, with the result that over $25,000 were thus won.

As the work proceeded it was seen that the mineral-bearing wash or débris was not more than 100 to 120 feet wide, while the real "pay dirt" had a much less width than this, and as seen in the cut that as the channel cut down it left on either side country rock apparently in place. In the pay dirt there was not only the solid ore but much decomposed mineral, all of which of course was swept away, only the boulders of galena, with all the surface decomposed, remaining; one of solid galena weighing over 13 cwt. While some believed that the ore had been brought down from a vein higher up on the mountain side, the fact that this ore was found only in a narrow channel, and that immediately above the slope of the mountain ran back with a gentle rise, led to the belief that the washing was being done very close to the vein, if not immediately above it, and this conclusion then arrived at has apparently been confirmed in that this washing is now reported by the manager to have disclosed the solid vein in place, with a strike S. W. and N. E., and regular underground mining has been begun.

A good wide track or trail, 7,500 feet long, was built from the mine to Sandon, and the ore is packed out to the railroad, the ore assaying from 113 to 133 ounces of silver per ton, and 70-76 lead, and Mr. Field has succeeded not only, as he claims, in uncovering the vein by this method of prospecting, but has recovered 400 tons of first class ore from the débris.

Argo.

North of the townsite of Sandon are three claims, the *Argo*, *Belt*, and *St. Charles*, owned by Wm. Snowdon, Jno. A. Whittier, and Alex. McDonald, and immediately above the K. & S. R. R. and a few hundred feet from the town, hence near the bottom of the deep valley of this branch of Carpenter Creek, ore was found during the past summer, and on the surface in one place the vein was cleaned off for 10 to 12 feet, showing a maximum width of three to four feet of solid ore. A tunnel, then 45 feet long, was being run to explore this new ledge.

Monitor.

This claim, 1,500 by 1,500 feet, Crown Grant to be applied for, and the *Hustler Fraction*, are located at Three Forks, on the south slope of the south fork of Carpenter Creek, and are owned by the locator, George A. Petty, who, finding the white-coated galena float on the hillside after considerable search, found the vein which runs north-east and south-west and dips south-east 60° to 90°, crossing the slates at right angles, in close proximity to a porphyry dyke. This vein varies in width from a few inches to 3½ feet of galena and carbonate, or oxide ore, and by surface cuts has been found to be faulted in two places to the north-west at one point 50 feet and the other 30 feet.

The lowest tunnel, No. 1, 161 feet long, is a cross-cut, but has not yet disclosed the vein, but in No. 2, 15 feet higher up the hill and 275 feet long, the ore is continuous for 195 feet, and from 3 inches to 2½ feet wide, and at the face the 50-foot fault is struck and a cross-cut to the west is being driven to pick up the continuation of the lead. Tunnel No. 3, 100 feet above, after cross-cutting 50 feet had just struck the vein, where it was much broken up. Tunnel No. 4, 110 feet above No. 3 and 480 feet from the north end-line of the claim, or 300 feet south-west of the mouth of No. 1, is a cross-cut for 73 feet, and then a drift both ways along the vein, with a stope 75 feet long and 38 feet to the surface in which was a fine shute of ore, 12 to 16 inches wide, that at either end has changed to zinc blende, but in all probability will again be found to improve on extending the drift. The foot-wall of the vein is very smooth and regular, and apart from the solid ore there is much shattered slate cemented with quartz and galena. The 30-foot fault is south-west of this working. All the mine buildings, ore-sheds and mine timbering, where such was necessary, were in first-class order, and there is much good timber on the claim.

The ore is similar to that found in the other veins in the Slocan, only it carries an appreciable value in gold, the smelter returns showing that the galena, or crude ore, as shipped in car-load lots, assays from $2 to 14 per ton in gold, 112 to 304 ounces of silver, and 37 to 55 lead, netting, after deducting freight and smelter charges, from $91 to $203 per ton, one shipment of 19 tons returning $20 in gold per ton, 367.6 ounces of silver and 32 lead, or $249 net per ton. In the carbonate ores the gold values averaged for 88 tons over $13 in gold per ton, the silver values ranging from 128.4 to 323.8 ounces per ton, and the lead from 19 to 33%, or $83 to $212.40 net per ton. No tests have been made, as known, to determine whether this gold occurs in the sulphides or dessiminated in a free state in the quartz. Number of men engaged 12.

Other Claims.—On the mountain slope west of Carpenter Creek, the *Idler* is being worked by the Idler Mining Company, who have a vein of silver galena ore.

Alamo.

The Alamo Mining Company, capital stock $500,000, General Manager J. D. Farrel, Spokane, Superintendent P. J. Hickey, own the *Alamo*, *Ivy Leaf*, *Twin Lakes*, 76.6 acres, Crown-granted, and the *Clarence*, *Hampton*, *Victory*, *Morning* and the *Continental* claims situated in the Alamo Basin, 3½ miles up Howson Creek, which enters Carpenter Creek near where the concentrator is erected, along the track of the C.P.R., one mile below Three Forks.

The Mine.—In this vein has been found one of the largest and most productive ore shutes yet mined in the Slocan, an ore shute that extends into and is being worked on the Idaho claim. This vein strike, east and west (mag.) dip south 70° to 80°, crosses a deep spur from the main ridge, and thus offers the best of facilities for the driving of tunnels along it at different levels. Along this line of fissuring in the slates is much brecciated country rock, quartz, lime spar, spathic iron and ore, of which 8 to 9 feet of solid galena, interspersed with grey copper, have been stoped out, also carbonate ores, while much mixed or mill ore has been sent down to the concentrator. In some of the levels there has been encountered a cross-fault of considerable throw beyond which the ore shute has since been picked up. Tunnel No. 4, the lowest, extends west for 300 feet along the vein which here carries little ore, and the fault being met, the drift was run north-west 130 feet, then south-east 34 feet, striking again, apparently, the ledge. In tunnel No. 3, in 340 feet, and No. 2, a large amount of ore has been stoped out up to the Idaho side-line, the ore shute being 4 to 6 feet wide, the ore breaking to two smooth walls between which is both solid ore and ore mixed with shattered slates and quartz. Tunnel No. 1, 240 feet below the summit of the spur, was in several hundred feet, and the stopes from the lower levels continue on up for 30 to 40 feet above this level, when it pinches above where has been found the greatest width of ore in the mine. There is ample room for other tunnels below No. 4, and such will yet be driven in to exploit a large area of the vein. Ore is being found on other claims on this group, and men were at work prospecting and developing these other leads.

Transportation.—(*a*) From Tunnel No. 3 a 3-rail tramway, 340 feet long, ends in the ore-bins at (*b*) a very good waggon road, 3 miles long, dropping down 1,700 feet to the ore-bins at the head of (*c*) the exceptionally long 3-rail gravity tramway, 7,100 feet long, which is in two sections, 3,400 feet and 3,700 feet long respectively, and dropping 1,675 feet, delivers the ore into the bins at the mill at the C. P. R. track. The waggon road also runs down to the mill.

The Concentrator.—From the supply bins of 1,500 tons capacity, the ore is trammed into the mill, which is built large enough to permit, if needed, the doubling of the present plant of machinery. On the upper floor, after passing over a grizzly, the ore is fed to a Comet breaker, whence it passes to 16 by 30 inch rolls, and thence by elevator to 3 5-foot trommels, delivering 4 sizes to the jigs on the next floor, of which there are (1) 1 coarse two-compartment Hartz jigs, (2) 2 three-compartment Hartz jigs, and (3) 2 four-compartment Hartz jigs. The middlings pass to a 5-foot Huntingdon mill, and for classifying the fine stuff, Lake Superior classifiers are in use, the tailings going into V-shaped settlers, that feed to 4 double-decked 18-foot round tables. The power is got from a Pelton wheel generating 80 h. p., with water under a 224 foot head in a 12 inch penstock, from a flume that runs about 2 miles to the head gates on the south fork of Carpenter Creek, the water of Howson Creek being also utilised. The sacked concentrates are then loaded directly upon the railroad cars.

This mill was built by Fraser and Chalmers, Chicago, and its daily capacity is 50 tons. It is owned by the Slocan Milling Company, and is under the management of Mr. Farrel.

Idaho-Cumberland.

The Cumberland Mining Co., capital stock $500,000 in $10 shares, also under the management of Mr. Farrel and Superintendent Hickey, owns the *Cumberland*, Crown Grant, 32.74 acres, *High Ore*, *Daisy*, *Eastern*, *Thistle*, and the Idaho Mining Co., the *Idaho* and *St. John*, Crown-granted, 101.53 acres.

On the Idaho ground, the extension of the Alamo vein is being worked through that mine—tunnels 1, 2 and 3 having been extended across the line. In tunnel No. 1, a stope 25 to 30 feet above the level, had 10 to 30 inches of very good ore, and up a 60 foot raise, 12-15 inches of solid ore continued to the top, while in the face of the level were 2 feet of solid galena, and 4 to 5 feet of mill ore. These claims lie north and west of the Alamo group, in the Idaho basin.

In the Idaho basin, reached by a branch road one-half mile long from the main road, another vein on the Idaho, striking N. E. and S. W., and dipping S. E. 60°-70°, yielded a large amount of good ore from the upper cuts and tunnels, but in the main tunnel 550 feet long, there was found little ore, but 10 to 12 feet of brecciated slate, quartz, calcite and iron pyrites.

On the Cumberland, four tunnels had been driven in on a vein that runs parallel with the one just mentioned on the Idaho, but being only 150 to 200 feet west, it had not yet been shown whether this is another vein, or the Idaho vein faulted. The upper tunnels Nos. 1 and 2 were caved in, but in No. 3, a narrow vein of nearly solid galena and blende had been followed and stoped out for a distance of 350 feet, and in an under-hand stope a streak of 1 to 10 inches of galena was being mined. Tunnel No. 4 was not being worked. Several hundred feet lower down, a cross-cut tunnel had been driven 500 feet, to cut two small veins showing on the surface. All ore is shipped by the Alamo road and tramway, and treated, if concentrating ore, at the mill, and this property is proving very productive. On the Idaho and Alamo 35 men were engaged.

OTHER CLAIMS.—The *Hustler* and *Silver Bell*, lying south-west, and west of the Idaho claim, owned by a Victoria syndicate, are said to be traversed by both the Alamo-Idaho vein and the Idaho-Cumberland vein, on the latter of which work has been done, and much more will be done this summer.

YAKIMA.

The *Yakima*, *Sunshine*, *Monday* and *Oregon* in the next basin east of the Alamo, owned by the Sunshine Mining Co., Manager J. D. Farrel, was not visited, as work had been suspended, but several carloads of galena ore had been shipped from this property during 1894 and 1895.

OTHER CLAIMS.—Many other claims on these slopes are now being prospected, and with successful results. On the *Wild Goose* and *Corinth*, owned by J. Gilhooley, A. J. Murphy, and A. Behne, Three Forks, a vein of solid galena, 6 inches to 2 feet in width, has been stripped for 200 feet on the surface, and ore is now being mined in a tunnel driven in on this ledge. These claims are about three-quarters of a mile by trail up the creek beyond the Queen Bess.

QUEEN BESS.

On the east slope of Howson Creek, opposite to the Idaho Basin, are the *Queen Bess*, *Young Dominion*, Crown-granted, 78.2 acres, and the *May Be*, *Concord*, *American Girl*, *Hub*, and *First Extension*, the property of Jas. Moran, Jno. A. Finch, P. Larson, *et al.*, Superintendent, Jas. Moran, Three Forks. A ridge separates these claims and the Monitor, and on the Queen Bess claim has been done most of the work, resulting in the discovery of four veins within 500 feet. On the east vein a tunnel had been driven 200 feet, in which the ground was much broken up and the small vein decomposed, the ore from which produced in shipments by leasers in 1893, of 40 tons, 96 ounces of silver per ton and 74% lead. Work was being pushed ahead on the west vein, 300 feet distant, and in a 65-foot tunnel, after 15 feet of surface material, a vein, strike N. E. and S. W., dip S. E. 80 to 85, was followed for 45 feet and stoped up 20-30 feet, producing high grade ore assaying 141 ounces of silver per ton and 75% lead of a very coarse cubed galena, of which 25 or 30 tons piled on the dump were being sacked for shipment to the Omaha and Grant smelter. At the face a winze was being sunk on two leaders of galena separated by four feet of slate. The third vein lying between the east and west leads had only been stripped and thus traced for 200 feet, but there was a wide zone heavily iron-stained, slightly impregnated with galena, and reported to give assays in gold of $4 to $6 per ton. The fourth vein is 100 feet west of the west lead, and at the surface 6 inches wide of carbonate ore assaying 50 to 60 ounces of silver and up to 10% lead. The ore will be packed down over a short trail to the road and thence one-half mile to the Alamo tramway, and then delivered at the C.P.R. track. It had been decided to thoroughly explore this property, and this winter 14 men are employed.

CANADIAN GROUP.

On the summit of the ridge, at an altitude of about 7,200 feet, between the south fork of Carpenter Creek and Four-Mile Creek, or two miles S. W. of Sandon, whence a trail *via* the Ruth mine runs to these properties, are the *Adams* and *Brandon*, Crown-granted 86.1 acres, and the *Katie D.*, *Sarah B.*, and *Hill Top*, owned by M. Adams, Sandon, and W. H. Brandon, Slocan City. Several small galena veins are to be seen on these claims, but as yet not much work has been done to explore them. On the Hill Top a small vein of galena a few inches wide can be traced for some distance, strike N. and S., dip west 60°. On the south slope of the Brandon a vein is traceable down the hill for several hundred feet, sticking up as a rib of galena, calcite, and quartz, 4 to 12 inches thick, in which are driven two short tunnels, in the upper one of which the ore is cut off, while in the lower there are 3 to 5 feet of mixed milling ore. About 1,200 to 1,500 feet east of this is another vein, strike north and south, dip 60° west, which, although small, can be traced up the slope for several hundred feet and then down through the bottom of a narrow gully in the cliff, forming the north slope of the ridge at this point. A tunnel was in 35 feet under a smooth hanging wall, and the vein consisted mostly of coarse calcite, with some galena, but on the surface the ore was sticking out in places in ribs of solid big-cubed galena. There is very little or no timber on this ridge, and only small springs of water. Trails lead over to the Alamo and Idaho mines to the west along the ridge, or down the mountain to the south to Four-Mile Creek, and thence to Silverton, on Slocan Lake. No work was being done at time of visit—Aug. 21st.

THE IVANHOE.

Lying next to the Canadian group, on the east, are the *Ivanhoe* and *Elgin*, Crown-granted 81 acres, owned by the Minnesota Silver Co., Ltd., Pres., W. H. Yawkey, and under the same management as the Idaho and Alamo.

Mr. McConnel, in his report of 1895, says, "The Ivanhoe, situated high up on the slope of the mountain, shows several nearly parallel veins. Two cross-cut tunnels the upper 50 feet and the lower 90 feet in length, connected by an upraise of 70 feet, have been driven, and drifts have been extended along the lead from the ends of both tunnels for varying distances. The workings have exposed an ore shute 60 to 70 feet in length, with a maximum width of five feet of pure and concentrating ore. A contract for a third cross-cut tunnel, 150 feet below No. 2, had been let at time of visit."

During the past year about 15 carloads of ore were shipped to the smelters, and development work is being continually carried on.

ADAM'S GROUP.

On the same high ridge, and on the west of the Canadian group. lie the *Britomarte*, *Chamblet*, Crown Grants, 86.3 acres, *Midnight*, *Mammoth* and *Slater Fraction*, owned by Capt. R. C. Adams, Montreal, *et al.*

In the slates and limestones run many dykes and spurs of porphyry, and on the south slope on the Britomarte, close to the Canadian group, an open cut exposes a vein of mixed ore, *i. e.*, cube galena, calcite, and quartz, 15 to 30 inches wide, running north and south with a dip of 80° west, this vein crossing over the ridge where it stands up as a narrow rib of solid galena ore 4 to 14 inches wide and intersecting on the north slope another galena-bearing vein. On the south slope, running down the hill, are three or four narrow veins of galena close together, that nearly merge into one another at a point where a 12-foot tunnel has been driven in on a vein of 4 to 12 inches wide of nearly pure galena. On the north slope is a very steep, rocky face, scored yearly by snow-slides, and running nearly parallel with the dykes, are several small veins of the same kind of ore as found in the others. On one of these veins, traceable to the summit, a tunnel was being driven, and for its length, or 20 feet, there were four feet of mixed ore, calcite, coarse galena, blende, and grey copper, of which six or seven tons were on the dump. Above the tunnel on the surface this vein showed 8 feet of mixed ore, with small, nearly parallel, veins, evidently stringers from the main lead. About one hundred feet S. W. of this vein is another that showed in one place four feet of mixed ore, and was running 60° E. by S. 60° W. On the south slope two tunnels have been run in to tap these veins, one for 50 feet, 150 feet below the summit, where in a cut were 6-7 feet of concentrating ore, and the other 400 feet below the summit, for 245 feet, in which for the last 40 feet some ore had been followed.

This property can be developed by running a cross-cut tunnel from a place free from any likelihood of snowslides, as is done on other properties in this district, and from the same point an aerial tramway, on a steep grade, could be built down to a point convenient to a waggon road to be built to Sandon. Good cabins are being erected about 1,000 feet below the workings, and a trail, four miles long, as mentioned in connection with the Canadian group, leads down to Sandon.

Noble five Mines.

The original Noble Five group, located for 5,000 feet along the course of one vein, comprised the *Noble Five*, *Bonanza King*, *World's Fair*, *Knoxville*, and *Maud S*, 66.6 acres, but the two adjoining claims on another vein, the *Deadman* and *Wild Goose*, have been added since the consolidation of these properties as now owned by the Noble Five Consolidated Mining and Milling Co., Spokane, Wash.; Pres., Jno. D. Porter; Sec., J. F. Cutler; Gen. Manager, J. G. McGuigan, Sandon, B. C. Capitalization, 1,200,000 shares at $1 each.

This property is located about 3½ miles by trail N. E. of Sandon, and 2,500 to 3,000 feet above that town, on the steep southern slope of the mountain, on which have been discovered the series of veins now mined from the Payne group on the west to the Blue Bird on the east. There are two veins, and perhaps three, now known, striking N. E. by S. W., dip 60° S. E., through slates and limestones, intersecting at an angle of 30° to 45° the "porphyry" or granitic dykes through which the veins continue, and in places carry their best ore-shutes. The ore occurs both as solid galena and as carbonates and oxides in a spathic iron and quartz gangue, and from the limited workings these claims have yielded from $125,000 to $150,000.

Noble Five vein. On the surface in a rocky gulch scoured by snow-slides, are large croppings of iron-rock, which on being broken into is found to consist of galena, blende, and spathic iron, while in the mine the ore is arranged along a smooth, slickensided wall that is sometimes on the hanging and then on the footwall side, in bands arranged in one drift with four bands, *i. e.*, spathic iron, blende, spathic iron, and then galena, with fragments of slate scattered through the ore-shute and spurs of ore running off into the country rock. In the early history of this mine, when the costs and difficulties of shipping were excessive and changes of management often, small drifts were run in on the ledge and the ore extracted in an unsystematic manner, but under the new management the property is being developed in a thorough manner, and the mine placed in a proper condition for its best development and most economical working.

On the most southerly claim, the Noble Five, a tunnel 65 feet long and short cross-cuts were driven resulting in the finding of some good ore, but as this was a dangerous place for snow-slides this work has not yet been extended to prospect this part of the vein. On the Knoxville and Bonanza King has been done most of the mining, consisting at the time of visit (August 18th) of tunnels aggregating 1,380 feet in length and opening up the vein vertically to a depth of 600 feet. In these workings but little high grade ore was left in sight, although much ground remained to be prospected, but there were stopes 6 to 8 feet wide, while the amount of concentrating ore exposed, consisting mostly of galena in decomposed material, was considerable, and in some of the drifts, 7 to 9 feet wide. The mine was not in a condition at that time to show up or do justice to this large and strong ledge, but the three main tunnels to be run and connected by winzes will put this property on a proper working basis.

About 200 feet below these workings the main tunnel has been started in a place perfectly safe from slides and cross-cutted to the vein which on the surface at this point had a strong out-crop of galena. This tunnel will be extended well into the mountain along the vein and connected with the upper tunnels, thus enabling all ore to be brought down to the mouth of this main level, where will be the ore-bins at the head of an aerial rope-tramway, 6,100 feet long, vertical drop 2,100 feet, now being built to the concentrator at Cody.

On the Deadman and Wild Goose claims are several large dykes and tongues of "porphyry," and the Deadman vein is about 100 feet east of the Noble Five vein and parallel to it. No work is being done in any of the three tunnels; in two of which that were entered but little ore had been left in sight, but several faults were in evidence. Ore has been shipped for three years from this vein, or 26 car-loads in all, of ore that assayed 63 ounces in silver per ton and 15 % lead for the "carbonates," and up to 255 ozs. of silver per ton and 69 % lead for the solid galena ore.

There is little or no timber on the property of this Company, and in fact upon any of these properties high up on the mountain, fire having destroyed the most of it, but lower down on the slopes the supply is good.

CONCENTRATOR.—Following up his success with the Slocan Star mill, Mr. T. L Mitchell has just completed a mill on Cody Creek, at the Town of Cody, which is arranged practically after the same scheme as that followed out in the Slocan Star. A flume brings water from Cody Creek and in the conveyance of ore from the mine automatical devices have been introduced throughout. At the main working tunnel of the mine bins of 600 tons capacity automatically discharge into the buckets of the Finlayson double rope tramway, and at the lower terminal the ore drops into the bins of 260 tons capacity and thence automatically to the 9 by 15 inch rock-crusher and thence into the mill. The capacity of the tramway will be 20 tons an hour. The machinery for the mill has been purchased from the E. P. Allis Company, of Milwaukee, Wis., and the first-class ore and concentrates will be loaded into the cars of the K. and S. R. R. which has a branch line running to Cody.

LAST CHANCE.

This property, the Last Chance, 600 by 1,050 feet, Crown-granted, the *Starlight*, *Starlight Fraction*, *Blizzard* and *Little Widow*, Crown Grants applied for, lying immediately west of the Noble Five group, is owned by the Last Chance Mining and Milling Co., Spokane. Capital stock, 500,000 shares at $1 each.

There are two small parallel veins running N.E. by S.W., one standing vertical, the other dipping S.E. 50°, and two tunnels 100 feet apart in elevation. The upper tunnel is 240 feet long with cross-cuts and drifts on smaller veins that lead off from the main one, while the lower, a cross-cut tunnel, intercepts the inclined vein at 180 feet, along which drifting has been done for 140 feet, with an upraise to the upper workings. This tunnel was being continued to strike the other vein but had not done so at 100 feet, but it was in the works between these two tunnel levels that the character of the ore and the vein was best seen, as from an incline started down on the vein near the mouth of the upper tunnel, and when about midway between the levels extended as a drift, very high-grade ore had been mined where the vein, varying in size from a few inches to 3 feet of solid, rich silver-bearing galena was found to have, where galena was not solid, a quartz gangue with galena, forming good concentrating ore. Within surface influences the veins have suffered the usual alteration, and rich "carbonate" ore has also been stoped out.

While so far most of the work has been directed toward the development of this mine a quantity of excellent ore has been sent down by rawhiding to Sandon and thence shipped to the smelters, as in 1895 about 9 car-loads of ore assaying 166 to 191 ozs. in silver per ton and 71 to 78% lead, and in 1896 17 car-loads averaging 182 ozs. in silver per ton and 62% lead, were sold. This property is another example of many which have paid for themselves from the beginning, and during this last year a dividend of $20,000 has been declared, after providing for the new mine buildings, more extensive underground work and the purchase of other claims. There is but little timber on these claims. Foreman J. Regan. Number of men engaged 10.

OTHER CLAIMS.—Below this claim is the *American Boy*, now being worked by Thomas McGuigan, with a yield to date of 5 or 6 cars of good silver-lead ore, and the *Ajax*, under the control of Matthews and Braden, who also have the *Ruby Silver* at the northern end of the Noble Five string of claims, both of which mines have shipped high grade ore. Upon the summit, at an elevation of 76-7,800 feet, Dr. Hendryx, of Nelson, was driving a cross-cut tunnel on the *Galena*, to cut a vein of silver-lead ore that shows up well on the precipitous bluff to the north, and is thought to be the northern extension of the R. E. Lee vein. It has a strike N. E. by S. W. across the slates and limestones, and also across a prophyry dyke, and a dip of 60° to the S. E.

RECO GROUP.

Immediately to the east of the Noble Five claims on the same south slope of the mountain, lie the *Reucau*, *Texas*, *Clifton* and *New Denver*, 150.65 acres, Crown Grants applied for, and the mineral location, the Ephraim, the property of the Reco Mining and Milling Co., Ltd., Sandon, B. C. Capital stock, $1,000,000 in $1 shares; treasury stock 100,000 shares. Pres. and Gen. Manager, Jno. M. Harris,; Sec. F. T. Kelly, Sandon, B.C.

Two distinct silver-lead veins strike N. E. by S. W., dip 60° to 75° S. E., are being worked on this ground, *i.e.*, (1) Big vein and (2) the Small or Goodenough vein, and in all probability veins lying in contiguous claims will be discovered, on prospecting, to extend into this territory. This mine affords another example of the opening up and development, and the purchase of other claims, without any capital save that got in mining, from the beginning of work, of rich ore. On the Big vein have been run three tunnels, from which has been taken most of the ore extracted from this lead, save that from one small stope that yielded over $16,000, and in tunnels Nos. 1 and 3, the former 650 feet long, and the other 900 feet long, connected by a raise 125 feet long in the vein ; the veins consist mostly of decomposed vein matter, in places a few inches wide, in others several feet. Work on this vein so far has been confined to purely development during the past year, but in 1895, 4 carloads of galena, the ore yielded on an average 179.8 ozs. silver per ton, and 71% lead (smelter returns). While the carbonate ore or 9 carloads yielded from 89.3 to 161.6 ozs. silver per ton, and 23.2 to 37.1% lead.

From the Small or Goodenough vein, lying several hundred feet to the east, has come the richest silver-bearing galena yet found in Kootenay, the silver evidently occurring as argentite, although much ruby silver is found in some of the solid galena. The mining operations are being carried on in co-operation with the Goodenough mine, and three tunnels, Nos. 2, 4 and 6, have been driven to and then extended both ways along the vein in each of these properties ; the vein being from 2 or 3 inches wide up to 20 inches of solid ore, with in places only a narrow streak of iron-stained matter. The ore so lies that generally the ground can be mined out along it, leaving the ore to be afterwards broken down clean. The ground is faulted in one place with a lateral throw of the vein for 10 feet, and where the vein passes through the prophyry dykes the ore shute is found, generally, to be about the most productive part of the vein. From these tunnels several hundred feet of drifting have been driven, the vein being not always productive, but in the miners' term "in and out," and these levels will be continued much farther before reaching the limits of the claim. (*See* Goodenough mine below).

This ore, while mined from a small vein, is very profitable, and at the time of visit, in August, several tons of rich ore were piled at each tunnel mouth, and the following data from smelter returns will give some idea of the value :—The galena ore has run from 225 to 730 ounces of silver per ton, and 67% lead ; one lot of 21 tons assaying 730 ounces of silver per ton, and 67% lead ; and two shipments in 1896, or 45 tons, yielded net (or 95% of assay) 24,820 ounces of silver, and 27 tons of lead, or $340 per ton, after deducting all charges.

The carbonate ore from this vein, for 20 carloads, has yielded from 230 to 337.8 ounces of silver per ton, and 19 to 28% lead.

This company now propose to build an aerial tramway down to Cody Creek, and there erect a concentrator. Foreman, Alex. McPhee. Number of men, 15 (in Aug.)

GOODENOUGH.

The *Goodenough*, title, Crown grant, 8.3 acres, and the location the *Grey Copper*, 600 by 1,284 feet, lying south of the Ruecau, are owned by Jno. A. Whittier, Jno Thompson, and Jno. Martin, Sandon, and six men were at work on the "small vein," as described in the Reco above. In the workings, tunnel No. 6, or the lowest, was a cross-cut for 275 feet, and near the point of intersection with the vein an upraise had been made for 169 feet to tunnel level No. 4 along the Ruecau-Goodenough line, following for nearly all that distance several inches of the very high grade ore. In the N.E the drift ran off into the Reco ground, while to the S.W. the Goodenough drift, in 170 feet, with 500 feet of the vein on this level available before leaving the side line, had good ore for 110 feet both above and below the level, with a narrow streak of carbonates to the face, an improvement in the ore shute being expected when the vein passed through the dyke 30 feet ahead. In the tunnel levels Nos. 2 and 4, the relation of the vein to the surface was such that but a comparative short distance along the vein could be worked on this ground, and all was stoped out, but in the Reco these two levels were being extended to the N.E.

There is a fair amount of good timber. As in the other mines, greatest activity is during the winter season, when the cost of shipping ore to Sandon, by rawhiding, is $3 per ton, instead of $7 by packing on mules in the summer. The grade of the ore, of course, is similar to that sent from the Reco, the smelter returns for carload lots giving from 277 to 507 ounces of silver per ton, and 48 to 67% lead for galena ore, and 168.5 to 322.5 ounces of silver per ton, and 2 to 34% lead for carbonate ores, while one lot of 6½ tons assayed 768 ounces silver per ton and 64.1% lead.

OTHER CLAIMS.—To the east of these claims lies the *Blue Bird*, on which some work was being done on a tunnel. Three, if not four, veins have been discovered, and 10 to 12 carloads of ore, averaging 131 ounces of silver per ton, and 75% lead, have been sent to the smelters. South of the Goodenough property lies the Chambers group, *i. e.*, the *Chambers*, *Eureka*, *Jay Gould*, and *Wellington*, 600 by 1,500 feet claims ; one of the oldest locations in the camp on which exploratory work has been done, but the depth of wash here, at the base of the mounain, makes such operations more difficult than higher up, where the surface is pretty well scoured off the leads, and any float can generally be soon traced to its source. One carload of ore was shipped during 1896.

Much good country in this vicinity yet remains to be explored, and while but little or no ground is now left open for location, there is every probability that thorough prospecting will be followed by good results.

The *Omega*, south of the Reco group, has a vein of galena ore, but all work is at a standstill pending legal decisions as to the ownership of this ground.

R. E. Lee.

Title, Crown Grant, 600 by 1,500 feet. Located on the ridge of the mountain, one-quarter of a mile west of the Last Chance, and five miles by trail and road from McGuigan's Siding, on the K. & S. R. R. Owned by Lorenzo Alexander, of Kaslo. At the time of visit, in August, ten men were employed by leasers, who were working on a narrow galena vein, striking N.E. by S.W, and dipping S.E. 45°, near a very large exposure of "porphyry" or eruptive granite. Two tunnels, one 500 feet long, had been run in and connected by a 95-foot upraise, and from the lower tunnel, down an incline, some ore was being extracted. In places in the mine the ore has been found 18 inches wide. During the last year about three carloads of ore have been shipped that averaged 130 ounces in silver per ton and 75% lead, the cost of transport to the railway line being $5.50 to $7.50 per ton. Mr. Alexander has now 8 or 9 men at work, is building more substantial living houses, ore sheds, etc., and from the mine is taking some good ore.

Slocan Boy.

This claim, 600 by 1,500 feet, title Crown Grant, lies on the ridge immediately east of the Payne group and south of the Washington, and is leased by S. K. Green *et al*, to T. M. Gibson and Lang Keith.

Two leads were being worked, one on the south end of the claim, a very small but rich silver-lead vein, being worked through three tunnels, one 140 feet, another 160 feet long. The other, the southern extension of the Washington vein, is also argentiferous galena that follows along two to three feet from an eight foot porphyry dyke, on both sides of which the shales and slates are very much contorted and to a very considerable extent converted into gangue matter. Beginning at the north end-line a tunnel is run in 170 feet along a small streak of ore, and connects with level No. 1, 235 feet long, which runs from the shaft, 200 feet deep, where at a depth of 100 feet the vein, here dipping at a high angle, is passed through. Eight to ten carloads of ore, both galena and carbonates, had been shipped, of which 30 tons of the ore from the small vein gave 332.4 ounces of silver per ton, and 75.4% lead, while the ore from the other vein averaged over 100 ounces of silver per ton and 68% lead.

Payne Group.

At time of visit, part of this property was in litigation, recently terminated by all interests being bought up from Mr. S. S. Bailey by Mr. A. W. McCune *et al*, and this group will comprise the *Payne*, *Mountain Chief*, *Maid of Erin*, and the *Two Jacks*, 38.4 acres, title, Crown Grants, with 2,500 feet along this vein, located on the ridge forming the western end of the range on which are the mines that have been described, three miles east of Three Forks, and three or four miles N. W. from Sandon, to which place is being built a new waggon road.

The Payne was the first location made in the Slocan District and the locators believing the trend of the vein would follow the strike of the country rocks as at Ainsworth, put in their stakes accordingly, and in reality made their location across the vein. Until lately this ground had been opened up by Mr. Bailey, and on the Payne a tunnel has been run in for over 300 feet, with ore continuous for nearly all that distance, the vein strike, N. E. by S. W., having a quartz gangue, but with a maximum width in parts of solid high grade galena of three feet. Substantial mine buildings were being erected at this tunnel mouth, to supplement those already built, and on the Maid of Erin, to the south, a tunnel lower down had been begun and extended into the Payne claim. To the north of this claim, on the Mountain Chief, tunnels had also been run in on the vein, and ore stoped out to the grass roots, but the main mining operations will be conducted from the southern side of the mountain, on which slope is a fair amount of timber suitable for mining purposes; fires having destroyed most of the wood supply. It is reported that over (Sept. 1896) $100,000 worth of ore has already been sold from this vein, the carbonates assaying 80 to 100 ozs. silver per ton, and 35 to 40% lead, and the galena ore 175 ounces of silver and 70% lead, or an average net value on all ore sold of over $100 per ton. Mr. Scott McDonald, formerly in charge of the Skyline, is superintendent of the work now being vigorously carried on. At time of visit 28 men were engaged on the different claims.

WASHINGTON.

On the northern slope of this mountain the *Washington* was located on the vein that showed in the face of the cliff, and over 1,400 tons of ore were shipped in the early years of 1892-3-4, but work ceased until the end of 1895, when the concentrator was built, permitting the shipment of much mill ore on hand in the mine and on the dump. This claim, Crown granted, 14.76 acres, together with four mineral locations, is the property of J. L. Montgomery, of New York; J. L. Retallack *et al*, Kaslo.

The porphyry dyke in places lies next to the ore, but so far has not been found to cut across the vein, which, with a strike N. E. by S. W., and a dip to the S. E. from 60° to 85°, is 3 to 12 feet wide, with an average width of 5 to 6 feet of galena in the gangue of spathic iron and quartz with zinc blende, much of which is sorted out. Bodies of clean, solid galena are also mined, but there is very little carbonates or decomposed ore. In the upper tunnel, No. 1, 77 feet long, there was considerable mill ore, but most of the ore came from tunnel No. 2, 200 feet below and 275 feet long, over which was a large stope 150 feet long and 30 feet high, with a good quantity of concentrating ore in sight, which on being broken was sent down to tunnel No. 3, 300 feet long, in which the ore-shute is much smaller and completely cut off at the face by a fault not yet explored. From the mouth of this tunnel level the ore passes down through a shute 180 feet long, to a 3-rail gravity tramway, 1,450 feet long, which leads to the shute down to the strong log ore-bins of the concentrator, where an excellent waggon road—one of the best seen in West Kootenay—three miles long, runs to McGuigan's siding on the K. & S. R. R.

CONCENTRATOR.—This mill was the first built in the Slocan, by Mr. T. L. Mitchell, who used machinery mostly made in Canada. It has a daily capacity, when water is sufficient, of 50 tons of ore, and the ore, after passing through a 4 by 10 inch Blake crusher into the supply bin, is automatically fed to the coarse rolls, and thence elevated to the revolving screen which makes three sizes. (*a*) The smallest screened material is further sized to 3 sizes by an hydraulic classifier, each of which passes to one of the 3 fine Hartz jigs, while the overflow of the classifier runs into a V-shaped settling tank, and the settlings of which are drawn off into a double round slime-table, the middlings from which pass to elevator No. 1, into the trommel, and then to classifier again; (*b*) Of the 2nd and 3rd sizes of the revolving screen, and the refusal or the product passing out at the lower end of the screen, each passes to one of the 3 coarse Hartz jigs, the middlings from which go to coarse middlings rolls, and then back by elevator No. 1. The middlings from the fine jigs pass to fine set of rolls, and also to elevator No. 1. The clean concentrates pass into concentrator bins, which drain into settling tanks to save the slimes, and all shipping material is sent down the hill in sacks.

ORE.—The crude ore or unconcentrated galena assays from 108 to 136 ozs. of silver per ton, and 66% lead, and during the past year, the concentrates, of which 50 to 60 carloads have been shipped, yielded 95 ozs. silver per ton, and 60% lead. As the water supply for the mill is for some months precarious, or only available for half of the year, and for the last season even less than that, it has not been feasible to pursue mining operations to that extent otherwise possible, but the development work will be done in the meantime, as there is a good site for another tunnel on the lead below the present No. 3.

BEST.

The *Best*, 600 by 1,500 feet, title Crown Grant, and the *Cincher*, alt. 5,800 feet, lie in the Best basin on the north slope of the mountain range, on which are the Reco, Noble Five and other mines already described, and are owned by A. W. McCune, Geo. W. Hughes, P. Larsen and Scott McDonald. The Washington Mine Road has been extended to the mine, which is thus 4 miles from McGuigan's Siding.

The ridge separating this basin from the Dardanelles basin is formed by a fine grained granitic boss, on which are the above claims and part of the Rambler group, and on the Best claim this mass is seamed with a series of quartz veins from a few inches to 6 feet wide, running N. W. and S. E. (mag.) and dipping north-easterly 30°-45°. The ore consists of quartz and rich silver-bearing tetrahedrite and jamesonite, with, in isolated places, galena and a little blende and iron and copper-pyrites. These veins are irregular in size, inasmuch as they will have a width of 2 or 3 feet, then pinch out or break into several small stringers. An incline shaft had been sunk 75 feet on one of the veins, and in this and a 25-foot drift, ore was continuous with a maximum width of 3 feet, and 120 feet down the hill in a tunnel 312 feet long; at 100 feet a vein of 6-8 inches of good ore was being followed to the S. E. for 65 feet (Sept. 6th), and at 215 feet a raise to connect with the incline was up 55 feet, at the foot of which was a vein 18 inches wide, of galena, grey copper and blende. The value of the ore shipped was not learned, but other shipments this winter are expected, when the mine will have been put in the best shape for good work. Foreman, F. Banaman, with 9 men.

Rambler Group.

Higher up in the Best basin and south of the Best claim, lie the Rambler group, *i. e.*, the *Rambler*, *Caribou*, *Antelope*, *Tiger* and *Best Fraction*, Crown Grants applied for, the property of the Rambler and Caribou Consolidated G. and S. Mining Co. Capital stock $1,000,000. Pres. J. B. McArthur, Rossland; Sec. A. L. McClaine, Kaslo; Superintendent, Richard Shea.

Although the ground embraced within the limits of this property has hardly yet begun to be prospected, two different series of veins have been discovered and are being worked. The veins first found were two quartz veins in the same granite as the Best, with the same character of ore, but when building a trail a narrow streak, a finger-width of red and brown iron oxides, betrayed the existence of a typical silver-galena vein, running through the Slocan slates series and porphyry, close to the contact with the granitic area, and since following this streak, three feet of solid high grade ore have been found in one of the tunnels. Galena ore in good quantity has been found in other veins on which a little work had just been done, and every indication pointed to the high value of this property.

(A.) Veins in the Granite.—About half way up the slope of the ridge of the granite, two strong quartz veins 200 feet apart, traceable to the summit 4 to 500 feet above, had been entered by two tunnels, and the strike of each was about N. 20° E., by S. 20° W., nearly at right angles to Best veins, a short distance away. In one tunnel 20 feet long the vein, dipping easterly 70°, consisted of a very white crystalline quartz, with druses, 3 to 20 inches wide, with parts of the vein strongly impregnated with grey copper and jamesonite, and in the other tunnel, 75 feet long, the vein, dipping easterly 40° to 50°, was continuous, with a width of 2 to 20 inches of very fine looking tetrahedrite or grey copper ore from a small slope in which, it was stated, 18 tons shipped to the Pilot Bay smelter had assayed 499 ounces of silver per ton, $7.50 in gold, and 2% copper. No work was being done on these veins at time of visit, but large and commodious cabins, ore-houses, etc., were being erected, there being a good supply of large timber in the basin. Mining was being carried on in the

(B.) Silver Lead veins.—The vein material mentioned above had been traced on the surface for over 400 feet by cuts, and tunnel No. 1, after being run as a cross-cut for 78 feet through porphyry and slate, had been drifted for 30 feet (Sept. 6th) along a vein of solid galena ore, in places a few inches wide, in others 12 to 24 inches, and at one point in the drift there were two bands of galena along what made the walls of the drift, with crushed country rock between. Along the planes of bedding and fracture in the rock, there were iron pyrites and galena, and the country rock was impregnated with pyrites. In tunnel No. 2, 170 feet long and 50 feet above and 115 feet beyond the face of No. 1 drift, the vein varies from 3 and 4 inches to 2 and 3 feet in width, but at the face the ore was scattered through the country rock. On the ridge a small tunnel exposed 2 feet of solid ore, of which 15 tons had been piled outside, and this vein appeared to be traceable for several hundred feet to some stopes made by leasers in 1893 on the Antelope ground on the slope of the ridge overlooking the Dardanelles basin. Although these stopes were badly caved in, the vein was seen to be lying very flat, with 2 to 3 feet of mixed ore, and in one place 2 feet of solid galena ore, and during the present winter this vein will be properly prospected and put in shape for mining.

The galena ore shipped, as per smelter returns, has yielded from 79.6 to 273.3 ounces of silver per ton, and 31 to 64% lead, one lot of 27 tons netting $185.12 per ton, while the carbonate ores, running 22½% lead, assayed 166 to 178.5 ounces per ton of silver. Ore shipments will be sustained, and it was proposed to extend the Washington waggon road *via* the Best up to the mine, to greatly facilitate the export of the mine output, and it is now reported that this has been done.

Other claims. On the *City of Spokane* Foss and McDonald were exploring for the extension to the south-west of the main lead vein.

SURPRISE AND ANTOINE.

In the next basin, or the Surprise basin, mining operations are active, but lack of time forbade a visit to the well known mines, the *Surprise* and the *Antoine*, that lie to the north of the Noble Five group, but down on the north slope of the ridge. The *Surprise*, title, Crown grant, 15.7 acres, manager, Alex. Smith, Kaslo, has made regular shipments of high grade ore during the years of 1894-5-6, and is now being actively worked. The *Antoine*, Manager, J. C. Ryan, Kaslo, is also shipping, ten car-loads of ore being sent to the smelter during the past year.

RUBY SILVER.

The *Ruby Silver*, owned by Matthews and Braden, Kaslo, is being developed, and during the last season the mine shipped two car-loads of high grade silver ore, one lot of 11½ tons assaying 198.2 ounces of silver per ton, and 46% lead, and another, 13½ tons, 256.4 ounces per ton of silver, and 66% lead. This claim, lying just north of the Noble Five claims, is Crown granted, and contains 17.34 acres.

DARDANELLES.

This important group of claims lies in the Dardanelles basin, between the Best and Jackson basins, but as all work was suspended in September, this mine was not visited. Recently the newly organised Dardanelles Mining and Milling Co., Ltd., of Kaslo, B. C., Sec. A. L. McClaine, Kaslo, capital stock $1,000,000 in $1 shares, has acquired the following claims, embracing 175 acres, the *Dardanelles*, *Dardanelles No. 2*, *Diamond Cross*, and *Okanagan* ; and mining operations on a sufficient and systematic scale are to be now inaugurated.

On the vein on the Dardanelles, cutting across the Slocan slates and the porphyry dykes, a shaft has been sunk 220 feet and 1,300 feet of drifts and raises run, and from these workings over 250 tons of high grade ore were shipped that averaged 265 ounces of silver per ton and 26% lead, while several hundred tons of second class ore, said to assay over 75 ounces of silver and 16% lead, were piled on the dump, 76 tons of which were shipped to the Pilot Bay smelter, giving the above returns. From a copy of the smelter returns the ore is seen to have run from 145.8 to 470.2 ounces of silver per ton, and from 15 to 56% lead ; one shipment of 10 tons giving this highest return, while 115 tons yielded 300 ounces of silver per ton. The ore carries a few units excess of zinc above the 10% smelter limit.

Other veins have been slightly prospected upon the Okanagan and Diamond Cross, but these will now be properly opened up. In the 220 foot shaft the small plant of a 7 H.P. boiler and a No 6 Knowles pump, was quite inadequate to handle the water, and a plant of requisite capacity will be now put in, and this vein will be extensively exploited. There is a good supply of timber for mine purposes ; and for transportation at present a trail 1½ miles leads out to the Washington waggon road and thence to McGuigan's Siding.

Wm. S. Tretheway, M. E., will be superintendent for the company, and the above information has been taken from his report to the company and from a copy of the smelter returns.

NORTHERN BELLE.

The *Northern Belle*, *Dublin Queen*, *Kootenay Star* and *Ophir*, surveyed for Crown Grant, located in Jackson Basin 5 miles south of Whitewater station on the Kaslo and Slocan R.R. and 4 or 5 miles by trail *via* Reco Mine trail, north-east of Sandon, have been bonded by R. Jackson to Geo. Alexander *et al.* Nine men were at work upon this property under R. J. McPhee, and a waggon road about 5 miles long, with all grades under 10%, was to be constructed from the railroad to the mine. There are many features of interest in this vein which, accompanied by a greenish coloured eruptive rock and cutting across the very carboniferous shales and slates and limestones, is much disturbed by faults of a small amount of dislocation. One peculiarity is that throughout all the workings where the vein has been explored, along the very smooth foot-wall lies a band of a few inches to 3 feet of solid zinc blende and above this, in a quartz and spathic iron gangue, is the galena varying in texture from the fine steel galena to the very coarsely crystalline. Up to 18 inches of solid ore have been mined, while in places in the mine there is a width of several feet of mixed milling ore. Prior to the giving of the present bond all the ore in sight had been extracted to cover the heavy legal expenses forced upon the owner by a former leaser, and ore was being found during the present development, but at time of visit the mine was just being put in proper shape for exploration. In the uppermost tunnel, No. 1, 50 feet long, work had begun on a big out-crop of decomposed vein-matter and blende, and 60 feet below, tunnel No. 2, driven in 250 feet, had been the source of most of the ore shipped. In the upper and underhand stopes the underlying band of blende always proved persistent, but as the ground was soft and much water was coming in, but little work was being done on this level, although 400 sacks of first-class ore lay at the tunnel mouth. The new cross-cut tunnel, No. 3, 60 feet lower down, was in (Aug. 23rd) 35 feet and apparently approaching the vein. Tunnel No 4, 135 feet vertically below No. 2, had been driven 340 feet along under a smooth wall, or along a line of fissuring, along which had been irregularly deposited a small amount of ore. Tunnel No. 5 had been begun under present management on the strong out-crop of the vein near Jackson Creek, in which a good amount of water for power and milling purposes is said to be available all the year round, and at the surface on the smooth wall lay about two feet of black-jack, then 3 to 4 feet of the greenish eruptive rock, and then a band 1 to 2 feet wide of steel galena, which continues, with a varying thickness, for most of the distance to the face, where lying next a very smooth hanging wall were 6 to 18 inches of this fine-grained ore. On the dump were 10 to 12 tons of good ore and a considerable amount of milling rock, and if further work justifies, a concentrator may be erected on this creek. There is a plentiful supply of good timber right at the mine, and the present management purpose a thorough exploration of the property, and with a new road ore can easily be hauled to a railroad at a cost of \$2 per ton. During the month of December 5 or 6 carloads were shipped to the smelters, the returns on which had not been received.

Other Claims.—Time did not permit the examination of other claims in this basin, but work was being done on several with very encouraging results, other veins of high grade silver-lead ore being uncovered. On the *Bell* and *Sunset*, at the upper end of the basin, L. Peterson was engaged by the owners, J. L. Retallack *et al*, Kaslo, in opening up a vein of this ore found running through these claims, and ore has also been found on the *Silver King* owned by J. Moore and P. A. McPhee, of Kaslo. About $\frac{1}{3}$ of a mile north of the Northern Belle very rich ore was found on a small vein on the *Bon Ton*, title Crown Grant, owned by Capt. R. C Adams, Montreal, but no work has been done for some time on this claim. On the *Crown Point*, formerly the San Franciscan, lying up on the mountain slope east of the Basin and of the Northern Belle group, it is reported that a silver-lead vein can be traced by different croppings through the claim, but nothing but assessment work has so far been done.

Whitewater.

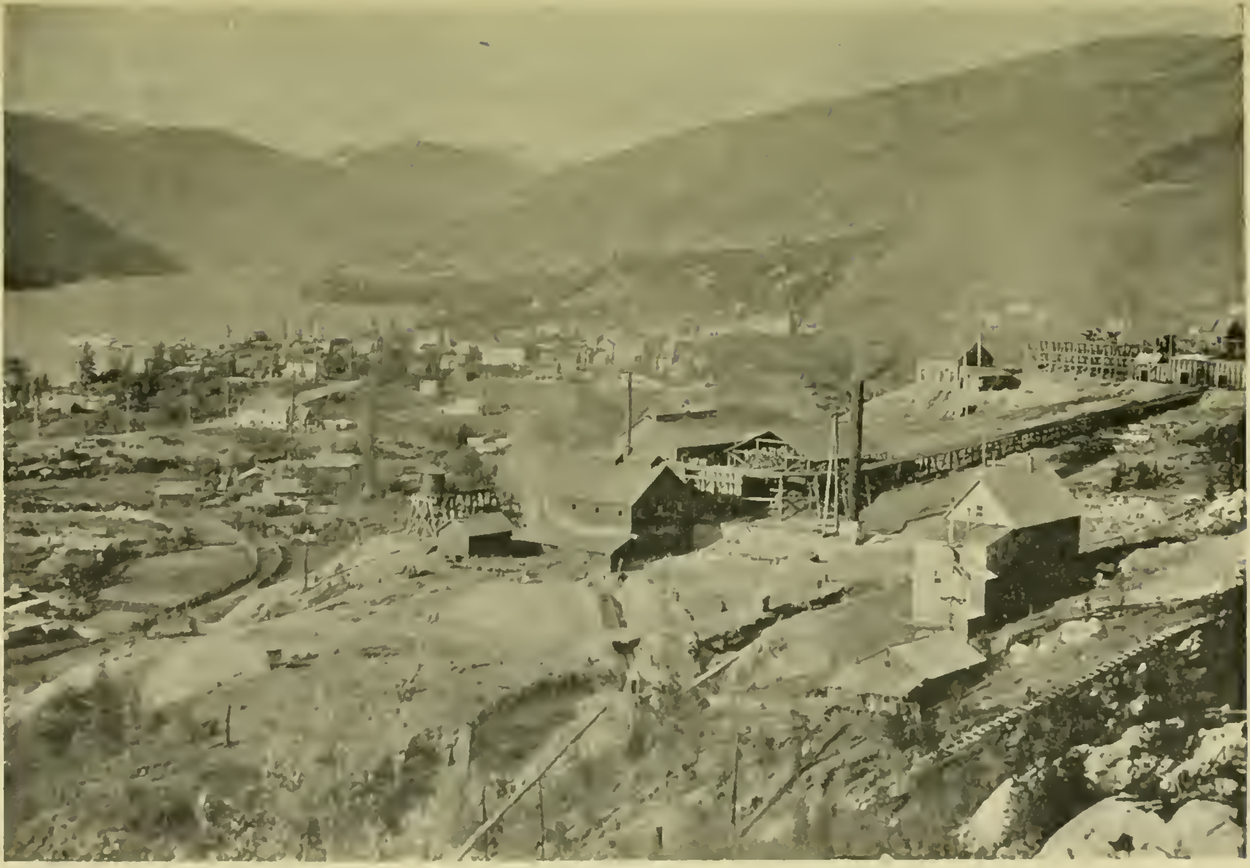
This property has also paid for itself since its discovery, high grade silver ore having been mined from the grass roots without ever a demand for money being made upon the owners ; and this year a dividend will be paid of \$25,000.

The two claims, the *Whitewater* and the *Irene*, Crown Grants applied for, are located about one mile north of Whitewater station on the K. & S. R. R., 18 miles west of Kaslo, and are owned by J. C. Eaton, J. L. Retallack, J. L. Montgomery, and W. C. Pierce, Kaslo; Superintendent, J. C. Eaton.

Crossing the shales and slates on the Whitewater claim the vein runs east and west (mag.) and dips S. 40 to 45. A good waggon road 8,300 feet long, has been built, at a cost of \$2,800, from the mine to the railroad, and there is an abundant supply of good mine timber, and also in Whitewater Creek ample water for power and other purposes.

In mining all the underground workings are kept timbered up in an excellent manner, as is imperative, as this vein is evidently located in a shear zone along which the country rock has been shattered and ground up for a distance of 10 to 25 feet from the fissure, so that very little blasting is required in this soft material, only pick and shovel work, while the timbers must be kept right up to the face, spiling even often being necessary. Along the well-defined smooth foot-wall or fissure plane, there is usually a band of spathic iron, sometimes five feet thick, and upon this will be found a varying thickness of galena and then carbonates or oxidised ore, the ore being often scattered irregularly through the broken mass of shale for a width of 20 feet.

On the surface the vein has now been disclosed for 800 feet, and from strippings several carloads of good ore have been shipped from the crushed mass of shale and iron oxides and yellow carbonates, copper stained by the decomposed tetrahedrite. In the mine the uppermost tunnel, No. 00, had been driven in 30 feet along the much decomposed vein, and ore was being piled up at the mouth. Tunnel No. 1, 260 feet below No. 00, had been driven west along the vein for 130 feet, but with little ore. In tunnel No. 2, 400 feet long, 75 feet below No. 1,



NELSON, B. C.

(See page 75.)

Showing Smelting Works of the Hall Mines Co., Ltd., and Lower Terminal of Aerial Rope Tramway, but not the New Refinery Buildings and Stack recently erected.

with 45° dip, 3 or 4 carloads of ore were extracted from a small stope near the entry and beyond this the vein was almost barren for 340 feet, when the ore shute widened from 6 inches to 6 feet of solid ore, and in the face, beside the carbonate ore, were 6 to 12 inches of solid steel galena. Tunnel No. 3, 96 feet on the dip below No. 2, had been extended 425 feet, with 4 to 10 inches of continuous ore for 200 feet, when in a cross cut, running both ways, was a mass of barren crushed shale about 20 feet wide, with a band of steel galena along either boundary of this zone. At the face of the ore shute was small, but the solid mass of spathic iron was 3 to 5 feet wide. Near the mouth of this tunnel $1,000 worth of ore was taken from a narrow streak of carbonate ore in driving 40 feet, and a winze had been sunk 15 feet to a short tunnel following good ore, and then 70 feet farther, with 2 to 4 feet of very high grade ore for 40 feet, of galena, varying from very fine to the coarsely crystalline and carbonate ores. In tunnel No. 4, 101 feet on the dip below No. 3, the heading was in 175 feet, and in the face was a solid band of spathic iron 2 feet wide on the regular dip of the vein, with a finely crushed mass of black slate and shale on either side. In a stope 40 feet long, and up one set above the drift, there were 6 to 12 inches of the steel galena, and then coarse broken galena, as if shattered by movement since deposition.

From this description it will be seen that work has been confined almost entirely to development, and that but little stoping has been done between levels. Good and commodious ore sheds were being built at the lower tunnel, and other mine buildings, cabin, etc., were close by.

Ore.—Six lots of ore sent from this vein was the first sent out of the Slocan, *via* Kaslo, and in the early days it cost $100 per ton before any returns were received. Much of the ore shipped is of the "carbonate" class, and the silver value ranging from 72 to 298.5 ozs. per ton, the lead from 11 to 30%, while the galena ore yielding 35 to 65% lead, assays in silver from 75 to 362.6 ounces per ton, or an average on the whole out-put of the mine for 1896 of 114 ozs. per ton, and 30% lead. This ore carries from 16 to 17% zinc, and the smelter charges vary from $9 to $13 per ton—$9 if the lead is below 20%; the cost of the freight being $1 per ton to the railroad, and $11 to the smelter. No. of men, 28.

Other Claims.—Work was being done on the *Elkhorn*, the eastern extension of the Whitewater, and on the *Charleston* further up the mountain, Mr. J. Mitchell was driving a tunnel to reach a vein from which he had already taken some ore. Seven men are now working on the *Corean*, the western extension of the Charleston; seven men are opening up this vein and getting some ore, and seven men are working on the *Lone Star*, the property of the Hansard Mining Co These three claims were staked out by Mr. Wm. Mathewson, the locator of the Wellington. To the east of the Wellington seven men are employed on the *Sunset*, on what is believed to be the extension of the Wellington ledge, which is thought to extend into the claim east of the Sunset, the *Colorado*, where again seven men are mining. On the *Eldon* and *Acton* claims, 3,000 feet west of the Lone Star, the Eldon Gold and Silver Mining Co., of Spokane, Wash., have at work ten men.

Wellington.

On the same mountain slope, one and a half miles west of the Whitewater, lie the *Wellington*, Crown Grant, 50.5 acres, *Ivanhoe*, *Ottawa*, *Metis*, *Bleucher*, *Goodluck* and *Bolderwood*, the property of the Kootenay and Columbia Prospecting and Mining Company, of Ottawa, Ont. Capital stock, $40,000. Superintendent, John McConnell, Kaslo.

On the Wellington are two veins in the Slocan slates, one striking N. 50° E and dipping 60° southerly, and the other dipping north, described by Mr. McConnell, of the Geological Survey, as a "wide crushed zone, traversing the slates in an east and west direction. The crushed slates hold stringers and pockets of quartz, spathic iron and calcspar." A cross-cut tunnel 170 feet long taps the vein at 10 feet in depth, and an 800-foot cross-cut tunnel intersects the south-dipping vein at 550 feet at the 200-foot level, along which so far the vein dipping north has not been found, although it is now being followed down towards this level. The works are all connected on the south vein from the 200-foot level, up in the 140-ft. drift the north vein is intersected. At present ore is being mined from both veins, but the highest grade ore comes from the vein dipping north. The mine is about 2 miles from the siding on the K. & S. R. R., and ore is packed down half way by the trail, and half way by waggon road. The ground is very soft, requiring little or no powder, but the timbering, as in the Whitewater, must be constantly kept up to face of work.

Ore.—From a copy of the smelter returns, the ore which occurs both as the carbonate and galena, with grey copper and zinc blende, in which is found good silver value, has assayed from 125 to 328 ounces of silver per ton in carload lots, and 10 to 55% lead, the average for 100 tons shipped, being 173 ounces silver, and 30% lead. Number of men employed, 24. During the year 1896, 25 lots of ore have been shipped, and the mine has been put in excellent condition for mining and further development.

THE LUCKY JIM.

The *Lucky Jim* group is located at Bear Lake, 20 miles west of Kaslo, 1,300 feet south of the K. & S. R. R., and 670 feet above it, and belongs to Wm. Braden and E. J. Matthews, of Kaslo. Mr. McConnell reports in the Summary Report of 1895, that this claim is situated on what "appears to be a faulted line of contact between the slates and a brecciated band of limestone. The ore occurs in large pockets and side fissures, penetrating the limestone." In developing this mineralized limestone band, in which the ore is galena, zinc blende, iron pyrites and some "carbonates," a 3-drill Rand Compressor is being used for the machine drills, but as most of this ore is concentrating material, it is proposed to erect a mill during the coming spring.

THE ORE.—Of 110 tons shipped, the silver value was 59.2 to 75 ounces of silver per ton, and 50 to 56% lead, and by tests in concentrating, the probable value of the concentrates will be 60-75 ounces of silver per ton, and 55 to 56% lead. Number of men employed, 15. Superintendent, E. J. Matthews.

LONDON HILL GROUP.

The *London*, the *Third of July*, the *Pompeii* claims, 1,500 by 1,500 feet, and the fractional claim the *Round-Up*, situated on the ridge of the mountains, west of Carpenter Creek, about three miles from Bear Lake and the K. & S. R. R., are being acquired by the London Hill Development and Mining Co., Ltd., Kaslo, B. C. O. T. Stone, President, T. G. Proctor, General Manager. Capital stock $150,000 in 600,000 shares of 25 cents each.

This mine was not seen, but Mr. D. R. Irving reports that near the summit of a ridge two tunnels had been driven, in one of which, over 40 feet long, was a 4-foot quartz vein, carrying grey copper ore and silver sulphides. On the other side of the ridge, 254 feet below the summit, a tunnel 320 feet long was being driven to tap the vein in depth, in which several small quartz veins, traversing the slates and quartzites were cut. Three lots of high grade ore, or about 40 tons, have been shipped, on which the smelter returns were 190 ozs., 267 ozs. and 150 ozs. of silver per ton respectively ; and this winter Mr. Proctor has a force of men engaged opening up this property. As in other veins of this character of ore, there is much 2nd class ore that will have to be milled near the mine, but the method to be adopted will be decided upon after more underground work has been done.

Slocan Lake.

This beautiful lake, lying in a deep valley between the valleys of the Arrow and Kootenay Lakes, is 23 miles long and about one mile wide, and in the valleys and on the ridges that trend away from it to the east, mines of very great promise are being rapidly opened up, and new finds of value are being made as prospecting is more thoroughly and widely carried on. As yet the great granite mountains to the west have not been found to be mineral-bearing, but more diligent search may reveal as good veins of rich mineral as have been found in the granite area east of the lake, which, until lately, was shunned by the prospectors, who had an unwarranted lack of faith in the likelihood of veins being in this formation.

However, all doubt has been dispelled, the granite area is fast gaining in importance, and this part of the Slocan now offers many good inducements for further search and investment. It is true that most of the leads so far discovered are small, but the high value of the ore to a great extent compensates for this, and as to their persistence, there is no reason why these pay-shutes should not continue to carry their size and value as depth is attained.

At Roseberry the lake steamers connect with the C.P.R.R., and then stop at New Denver, which has one of the best townsites in Kootenay, and is the official centre for the Slocan ; at Silverton at the mouth of Four-Mile Creek ; at landings at Ten-Mile and Twelve-Mile Creeks, or any other point desired ; and at Slocan City and Brandon, two rival towns at the south end of the lake, whence the trails lead off to Springer, Lemon, Twelve and Ten-Mile Creeks, and a branch of the C. P. R. will be built during the coming season to connect with the line running from Robson to Nelson.

On the south slope of the range dividing the south fork of Carpenter Creek from Four-Mile Creek, on the north slope of which are the series of mines, from the Slocan Star to the Idaho and Alamo, are the Mountain Chief, California, Alpha Group, Reed and Robertson, Jenny Lind, Ottawa Group and Fisher Maiden, all of which were visited, except the first two, and south of the Four-Mile Creek are the Thompson Group, Vancouver Group, and the Hewitt claim.

Four-Mile Creek, for ten miles of its course, forms a dividing line between the Slocan slates and the granite, although small areas of each cross the river in places.

THE MOUNTAIN CHIEF.

This property lies at the western extremity of this ridge and is owned by Mr. Geo. W Hughes, who was one of the earliest shippers from this district *via* Nakusp, having purchased the claim in 1892 and then shipped a large amount of ore in 1893-4 and 5, of galena averaging 130 ounces of silver and 70% lead. After this the lead was lost, and much work has been done prospecting for its continuation. This fall several car-loads of zincy galena ore have been shipped, and work is being pushed ahead.

THE ALPHA.

The *Alpha*, Crown-granted, 51.67 acres, and other claims are locally known as the Grady group, and are owned by Jas. McNaught, Alex. McKenzie, and Jas. McKenzie. Manager, F. McNaught, Silverton. A good road 2½ miles long from Silverton, leads to the foot of a 3-rail gravity tramway, about 1,200 feet long, up to tunnel No. 1. No work had been done for some time, as there was some litigation in progress, in fact, none since the fall of 1894, but over 1,000 tons of ore had been sold that averaged 115 ounces in silver per ton and 70% lead.

This vein runs true N.E. and S.W., and dips S.E. 30° to 40°, through the black limestones, shales, and slates, but no ore was in sight. The ground is much disturbed and faults were in evidence. There are five tunnels, of which No. 1 was in about 300 feet to the face, with three upraises, cross-cuts, and an incline, and another tunnel starting near the mouth of this one ran 50 feet N. 70° E., while immediately below was a third, connected by stopes with the upper ones. No. 4, 80 feet down the hill, is a cross-cut for 100 feet through the much contorted country rock, and then a drift 110 feet along a smooth fault wall lying next to which is much black gouge, but no ore. Tunnel No. 5, below No. 4, appears to be following another lead altogether, from the position and strike, or north and south, dip E. 45°-50°, and for 110 feet along a smooth wall with several inches of decomposed matter or iron oxides: but there were no signs of any ore having been taken from this working.

OTHER CLAIMS.—North-west about one mile is the *California*, owned by J. MacDonald, J. Marino, B. C. VanHouten *et al*, to which mine a road had been built from New Denver, as a car-load of galena ore was ready on the dump for shipment.

THE REED AND ROBERTSON GROUP.

High up on this range, 6 miles by road and trail from Silverton, is a very strong vein that runs up the south slope, crosses the ridge and then passes down the north slope as far, it is believed, as the Carnation claim, and along its strike eight or ten claims have been staked.

Reed and *Tenderfoot.*—These two claims, surveyed for Crown Grants, extend up the slope and across the ridge, and had been secured by Mr. C. W. Callahan, M.E., for his clients, who was prospecting the vein by surface cuts. The vein runs about north and south (mag.) and dips from 45° E. to nearly horizontal. At the southern boundary of the Reed a tunnel had been driven in 110 feet, disclosing considerable milling galena ore, and on the surface the ledge was very wide with also a good deal of mill ore occurring in wide bands of very coarsely crystallized calcite, 10 to 12 feet wide, while next to the calcite bands are several inches of solid galena. Higher up the slope the calcite bands continue, forming a prominent land mark from their whiteness, and in several cuts narrow bands of solid very large cubed galena lie next to these bands that at a point 300 feet above the tunnel come together in a solid mass of lime 10 to 14 feet wide, with several feet of concentrating ore, and few inches of solid lead ore. At the small cuts, about 30 tons of splendid ore were piled up, but more work is required to demonstrate the value and conditions of this very striking lead. There is no timber on these claims to amount to anything, and to get this ore in quantity down to Four-Mile Creek, a long aerial rope tramway, on a very steep pitch, will have to be built down a ridge safe from snow-slides.

The Jenny Lind, lying south of the Reed, has about 800 feet of the vein crossing one corner, and is owned by Paul and Chas. Anderson, Silverton. The vein presents very much the same characteristics of a large amount of calcite and brecciated slate and lime with irregular masses of concentrating ore and stringers of solid galena. A tunnel had been driven 150 feet in a direction diagonally across the ledge, but in it as yet no ore in quantity has been found. In 1895, 30 tons of galena was shipped, and on the dump was piled mixed ore or calcite, galena and blende.

The Robertson, lying south of the Reed and Jenny Lind, is owned by Wm. Robertson *et al*, Silverton. The vein is here covered mostly by wash, but a 40-foot tunnel had been run in where the ledge showed 8 to 10 feet of calcite, with little galena. No work was being done.

The *Wakefield*, *Ottawa* and *Cazabazhua*, owned by Geo. Fairburn and Wm. Smith, Silverton, and located on the southern extension of the vein, had on the Wakefield a tunnel running N. E. 125 feet, in which, at 80 feet, were 16 to 20 inches of solid fine-grained galena, beyond which was the coarse calcite lying on a dip of only 12° to 20° from the horizontal, and on the Ottawa further down the slope, the ledge is said to be lying even flatter. No work but assessment has been done during this year.

FISHER MAIDEN GROUP.

At the time of visit to those claims no work was being done, but they belong to Jno. Poppen and Albert Webb, Silverton, and lie along a small creek flowing into Four-Mile Creek, seven miles east by trail from Silverton.

This vein was discovered in a narrow gulch in syenitic granite, with a strike N. E. by S. W., and a dip 75° N. W. It shows on both sides of the gulch, where in two tunnels were stopes 1-3 feet wide up to the surface. Below these workings have been run two other tunnels. one on the south of the gulch being in 100 feet with cross-cuts, but showing no ore. On the north side over 400 feet of work had been done, in which four drifts had been run along smooth fissure planes that proved to carry no ore. At one part where two drifts branched off at an angle of 45°, was a winze full of water, close by which were lying several large blocks of galena ore in a quartz gangue. On the dump were pieces of ore, consisting of zinc blende in a quartz and spathic iron (?) gangue, also some galena ore, but the percentage of lead was very low. Native silver was found along the seams, and of about 50 tons shipped in the fall of 1894, the silver value is reported to have been 180 ounces per ton, while one lot of 9½ tons carried about 40% lead, the remainder 10%.

OTHER CLAIMS.—South of Four-Mile Creek are many locations on silver-lead veins, and work is being done on a number of important groups. *The Thompson* group, about six miles east of Silverton, on the Fennel Creek, has been bonded to Dr. H. Bell-Irving, of Vancouver, for $40,000, who is engaged developing a galena vein from which a considerable amount of ore has already been taken, and has contracted for the shipment of 100 tons of ore on the dump, while 300-500 tons are believed to be in sight that will yield about $100 to the ton on the average.

Farther west of this group, on Granite Creek, is the *Vancouver* group, embracing the Vancouver, Mountain Boomer, Le Roi, Iowa, and Doone, owned by the Moynahan Bros. The *Hewitt*, owned by Capt. R. G. Tatlow, C. F. Yates, *et al*, Vancouver, was being opened by Major Reed, with ten men, who was running a tunnel on a vein believed by him to be the extension of the vein on the Galena Farm, to be described, and the breast of the tunnel was reported to be all mixed ore or zinc blende and spathic iron, with 5 feet of mixed ore in a 75-foot shaft.

GALENA FARM.

This property, otherwise known as the "Currie Group," obtained its name by the finding of ore scattered over a plateau east of the Slocan Lake, and the subsequent discovery of the large ledge that now bids well to rank among the largest producers in this district. Great importance may be attached to this vein in that, while resembling in many details the large Slocan Star lead that runs through the slates and limestones, this is evidently in the granite, although pieces of slate occur in the quartz gangue, a small, but very probably shallow, area of slates occurring close by, but bosses of granite protrude from the wash all over these claims, from which the slate formation has been eroded, and this lead not only demonstrates the importance of the granite area, but also points to the persistence of the veins in the different geological horizons.

The first to work this property were discouraged rather by the presence of much zinc blende and the small amount of galena scattered through the ledge matter, but in the prospecting done during the last season by the present owners, fine solid galena ore with high silver values had been uncovered. The group of claims comprising the *Currie*, *Grover*, *Stephenson*, *Katie* and *Peerless*, Crown Grants applied for, one and a half miles south of Silverton, and one mile east of the lake, was secured by Mr. C. W. Callahan, M. E., for English investors who have recently formed the Galena Mines Company, Ltd., London, England, with a capital of £550,000, in 550,000 £1 shares.

On the Currie claim this vein was seen to have a strike east and west (mag.) and a north dip of 50° to 65°, and on the surface, and an outcrop now traced for 1,600 feet, with, in places 12 to 14 feet wide, of milk-white quartz, spathic iron, fragments of slate and granite, and some zinc blende and galena. In an old shaft, at a depth of 50 feet, a short cross-cut entered the vein at 12 feet, and there a drift was run 60 feet east and 70 feet west, exposing a large body of concentrating ore for all this distance, and along the smooth hanging wall a good body of solid high grade galena. In the west drift, 35 feet from the cross-cut, a winze was being started, since sunk 15 feet, in four feet of solid, fine-grained galena. In an open working 500 feet west of the shaft, were 16 inches of solid galena along a smooth foot wall with considerable concentrating material.

Since the time of visit a 2-compartment working shaft, now down 65 feet, has been sunk west of the old shaft and 140 feet north of the outcrop, with the expectation of striking the lead at 130 feet, but at 41 feet what is believed to be a cross-ledge running north and south was entered, dip 60° west, and down to 51 feet the shaft was in concentrating ore, that by tests made by Mr. Callahan, concentrating 5 to 1, yielded 123 ounces of silver per ton and 62% lead. This cross-lead is now thought to be traceable for 800 feet. The shaft, equipped with requisite steam hoisting plant and pumps, will be now sunk 500 feet, with cross-cuts to the vein at every 100-foot station, and when sufficient development justifies it, a 150 ton concentrating plant will be built, for which the water from Eight-Mile and Gold Creeks is expected to supply 600 inches under a 500-foot head. The ore is essentially a milling ore, but a test shipment of assorted assayed 98 ounces of silver per ton and 57 lead. A good waggon road, 1¾ miles long, has been constructed from the mine to Silverton, whence the concentrated ore will be shipped to the smelters, and suitable bunk-houses, etc., have been erected. D. J. McDonald, a Cailfornian, a mining man of long experience, is in charge of the work as superintendent, and was employing 20 men in the proper exploitation of this valuable property.

Other Claims.—Many claims have since been located about the Currie group and many are being prospected. To the east the *Noonday* is thought to have the extension of the Currie vein, but here the formation is the small area of highly altered slates. The *Baby Ruth*, *Los Vegas*, *Mountain View*, *Granite Mountain*, and *Daisy*, on Eight-Mile Creek, occurring, according to Mr. McConnell, in an inlier of hard, rusty slate several miles in extent and enclosed, the granite, reached by trail from Silverton *via* the Galena Farm, were not visited, but assessment work was being done. The *L. H.*, also one of this group, is situated high up on a very steep ridge, and Mr. McConnell (Summary Report, 1895, p. 26) says: "The slates are tissured along an east and west line, and the schistose rock adjoining the line of fracture on the south, has been altered, silicified, and impregnated in places with ore, along a zone varying in width from 20 to 40 feet. The ore appears to consist mostly of native arsenic, mispickle, pyrite, and pyrrhotite, distributed through the vein in an irregular manner." Four hundred feet up the steep face of the bluff a tunnel had been driven in 22 feet into this zone, but very little mineralization was apparent there. Mr. J. M. M. Benedum, one of the owners, has obtained several assays high in silver and gold from samples taken from this vein, on which only assessment work has been done.

TEN-MILE CREEK.

An excellent waggon road has been built from the landing eight miles up this creek, through a valley of fine timber, to the Enterprise mine, and thence trails pass over to Springer and Lemon Creeks and back to Slocan City, and also farther east to the head waters of Kokanee or Yuill Creek and the south fork of Kaslo Creek, where a great deal of prospecting has been done during the past season, with good results.

THE ENTERPRISE.

The success attending the development of this vein, has, to a great degree, demonstrated the possibilities and the value of this granite area. The *Enterprise* and *Slocan Queen*, situated on the slope south of the creek, were located in 1894 by R. Kirkwood and Jno. McKinnon, then bonded to Jno. A. Finch, who recently sold these to David M. Hyman, *et al.*, Colorado, for $300,000, on the advice of D. W. Brunton, of Aspen, Colo., one of most eminent Mining Engineers in the West.

This vein on the surface, while small, can be easily traced for two claims, and runs N. 55° E. and S. 55° W., and dips S. E. 70°-80°. The gangue is quartz, the enclosing walls are a dark coloured micaceous granite, that shades into the typical syenitic granite of this area, and the ore is fine and coarse grained galena, with a large amount of zinc blende, which, it was stated by the management, carried the best and very high silver values, and is found generally along the foot-wall, with bands of galena and quartz. In July last, a shipment to the smelter of 40 tons of ore yielded 172.7 ounces of silver per ton, and 18% lead, and during December in three shipments, or 120½ tons, the silver values ran from 153.7 to 179.5 ounces per ton, and the lead from 17.5 to 30%, and now 2 or 3 carloads of ore are being shipped every week.

Three tunnels were being driven in on the vein, with the fourth just being started, and in the lowest or No. 1, 120 feet long, the vein of solid blende and galena varied from 2 and 3 inches, to 8 and 10 inches in width, and as in the other workings, the tunnel was being driven along the ore, leaving it standing to be broken down clean. Tunnel No. 2, 170 feet vertically above No. 1, was in 400 feet, with continuous ore for 300 feet, where an upraise 100 feet to surface, followed ore over 8 inches thick for 80 feet, but at 330 feet a fault had been encountered, beyond which the vein had not been picked up, but cross-cuts were being driven with the probability of finding it in the south-west. In this tunnel the ore was 8 to 18 inches wide, with very little gangue matter, and overhand stopes were being started. In tunnel No. 3, 25 feet above No. 2 and 310 long, for 260 feet the vein carried continuously 6 to 12 inches of ore, with more or less quartz, with one small fault to the S. E., but for the last 20 feet the vein was pinched. In the opening cut for tunnel No. 4, 90 feet above No. 3, were 6 to 14 inches of solid ore, and thus, by these workings, for about 1,000 feet along the strike, had been exposed an almost continuous shute of ore for this distance. Bunk-houses, cabins and ore-sheds had been built, and the ore will be shipped by the road to the lake, and thence by steamer to the C. P. R. R. Number of men employed, 20.

OTHER CLAIMS.—The *Iron Horse* and *United Empire* are located on the N. E. extension of the vein, and still further N. E., but on the north slope of the creek, this vein is said to have been found on the *Alexandria*. On another claim on the north slope, the *Oregon City*, owned by Jno. Thompson, L. Parkinson *et al*, in a 50-foot tunnel, it was reported that 7 to 8 inches of galena ore had been struck, and that ore was found on the *Westmount*, owned by F. Griffiths, N. West, *et al*, who were running a cross-cut tunnel.

NEEPAWA.

About one-half mile west of the Enterprise, and on the same slope, lie the *Neepawa*, *Argenta*, *Bossimain* and *Baker Fraction*, owned by E. Shannon and A. McGillvary, and since bonded to H. Bell-Irving, of Vancouver, of the Alliance Prospecting Syndicate, for $30,000. The vein running N. 20° E. by S. 20° W., and dipping easterly 60°, had been prospected by open cuts and a tunnel, and in one cut there were 10-16 inches of solid fine-grained galena and zinc blende, with 3 to 4 feet of concentrating ore, and since then ore has been found in a lower tunnel, and a trial shipment has been made to Tacoma.

A cabin was being built, and only a few hundred yards of road will be necessary to connect with the Enterprise waggon road.

DALHOUSIE GROUP.

These claims, still further west, were not seen, but the *Silver-Joe*, *Dalhousie*, *Glad Tidings*, *Sayger* and *Iaccamock*, are owned by Jno. Angrignon, Jos. Pilon, M. McLean, *et al*, who had driven a tunnel 110 feet on the vein, with 2½ feet of concentrating galena ore reported, and with 4 men were driving a cross-cut tunnel to the ledge, which runs N. E. by S. W., and stands nearly vertical.

THE BONDHOLDER GROUP.

The *Bondholder*, *Pine Log*, *Lone Star* and *Rose Bud* are located on a vein supposed to be the same as the Enterprise, high up in the basin near the ridge south of Ten-Mile Creek and are bonded to the Bondholder Mining Co. of Vancouver. Capital stock $1,000,000; Gen. Manager, R. C. Campbell-Johnson, M.E.

This vein, running N.E. by S.W. (mag.) and with a dip of 50° to 60° S.E. in the granite, had been traced by cuts and out-croppings for 4,000 feet through nearly the entire length of the claims, and at the time of visit, in September, commodious cabins for the men, stables, &c., were being erected, and development had just begun, but little could be then seen of the vein, as the work had hardly progressed far enough to expose other than the surface influenced part, where it was in places 12 to 16 inches wide of blended quartz, iron oxides and galena, and in others more solid galena with some blende. On the Pine Log a short cross-cut tunnel, then in 25 feet, was nearing the vein, down which an incline was to be sunk, and to the S.W. over a thousand feet distant, and near the ridge, an open cut showed an 8 inch vein, while to the N.E. on the Bondholder, where the vein can be easily seen for several hundred feet cutting across the face of the steep bluff, tunnel No. 2 was in just 12 feet and showing mixed ore in the face. Excellent facilities are here for the extensive development of this vein, and when the extraction of the ore begins a trail for rawhiding will have been built down to the road along Ten Mile Creek, 2,600 feet below the mine, and a waggon road may be built. This property can be also reached by trail from Slocan City, *via* Springer Creek. Foreman B. C. Bradshaw was in charge of 15 men.

KALISPELL.

The *Kalispell*, Crown-granted, 37.1 acres, is located on Ten Mile-Creek one mile from the lake, in a small area of stratified rocks, *i.e.*, altered slate quartzites &c., and is owned by Wm. Lardner, Deadwood, South Dakota. In a 75-foot tunnel on the south bank of the Creek is seen evidence of a shear zone and later faulting, and along this is quartz, crushed country rocks, galena and silver minerals, such as ruby silver. Some stoping has been done along this lead that has a strike of N. & S. (mag.) and a dip easterly of 70°, and several tons of high grade silver ore have been shipped, of which 8 tons assayed 289 ozs. of silver per ton and 3 tons 212 ounces. There is ample water in the creek, and a large amount of fine timber on the property, and a short trail connects with the waggon road. No work was being done at time of visit in September.

Springer and Lemon Creeks.

From the rival towns of Slocan City and Brandon at the foot of the lake, trails lead off to the country drained by Twelve-Mile, Springer and Lemon Creeks, and in this part of the district many locations have been made, some on galena veins, but many others on the "dry ore" veins and the gold-bearing quartz leads, all in the granite. Much prospecting was being done and considerable development work; but as many investors have recently been securing bonds and options on many locations, the coming season promises much greater activity, and certainly the careful attention of mining men is warranted by the very favourable results already attained by the as yet very small amount of work. The Howard Fraction, Two Friends Group and the Arlington were visited, besides these properties on Ten-Mile Creek already described, and the writer is much indebted to Messrs. Gwillim and Johnson, Mining Engineers, Slocan City, for information concerning other claims it was impossible to visit this season.

THE TWO FRIENDS.

This claim, 1,500 by 1,500 feet, is 7 or 8 miles east of Slocan City, on the divide between Springer and Lemon Creeks, and is bonded to the Two Friends Mine Co. Ltd.; Pres. F. C. Innis, Sec. C. C. Bennett, Vancouver. Capital stock $240,000 in 800,000 shares at 30 cents each.

By the discovery near a small spring, of a little honey-combed quartz sprinkled with zinc blende, another vein in the granite of very high grade galena had been located, and was being opened up in an excellent manner by Capt. J. A. Wood when visited in Sept. With a good supply of timber close at hand, good mine buildings were being completed and all the underground workings carefully timbered up where necessary. This vein strikes N.E. by S.W. (mag.) and dips S.E. 80°, and Tunnel No. 1, after cross-cutting 25 feet, ran 50 feet along the vein which was stoped up 10 or 12 feet to the surface, and about 100 feet below. Tunnel No. 2 was driven 206 feet in 60 days to the ledge where the solid galena in large crystals lies next the smooth well defined foot-wall, or with a narrow seam of iron oxides between, while next to the hanging wall of dark, fine-grained altered granite was segregated more or less of zinc blende. To the S.W. a narrow dyke crosses the vein, beyond which no work had been done, and in the drift, then about 40 feet long, the vein varied from a narrow streak to 12 to 14 inches of solid blende and galena ore, which in a raise up 20 feet and 8 feet wide there were 12 to 16 inches of this solid, clean, very rich ore.

ORE was then being shipped by pack-horses to Slocan City, at a cost of $15 per ton, which rate will be made less when the rawhiding season has begun after the fall of the snow. Up to the end of the year shipments of over 10 tons of silicious high grade ore had been made that yielded, as per smelter returns, from 250 to 380 ounces of silver per ton and 38 to 52 lead, and ore, after deducting all charges, showed net to the owners the high value of $150 to $160 per ton. Number of men 20.

THE ARLINGTON.

The vein found on the *Arlington* and the *Burlington*, owned by R. Cooper and C. Fielding, of Slocan City, and located 6 miles from that place, on the north slope of Springer Creek, on the trail leading over the divide to the Enterprise mine, has attracted much attention by reason of the rich specimens of native silver found along the cracks and crevices in a zone of shattered granite, in which also are small stringers of fine-grained galena and zinc blende, the native silver evidently being deposited in this state within the region of surface influences. This zone of crushed, and more or less altered, mineralised granite, 4 to 6 feet wide, has a strike N.E. by S.W. (mag.) and dip to the N.W 55°, and has been traced, it is claimed, through several claims. About 30 feet of tunnelling had been made on either side of a shaft, then down 55 feet on the vein, with drifts at a depth of 35 feet, of 45 feet showing this broken country rock with stringers of ore and quartz, and on the dump were piled 70 to 80 tons of ore, the value of which could not be learned as none had been shipped to the smelters. This winter the owners are continuing the development work.

THE HOWARD FRACTION.

This was the only "dry ore" property examined, and on the south slope of the divide, or Gold Hill, between Springer and Lemon Creeks, 8 miles from Slocan City, lie, besides many other claims, the *Howard Fraction*, *Tiger Fraction*, *Altgeld*, *Deadwood*, *Bland*, and *Free Gold*, owned by A. E. Teeter, Wm. Price, V. T. Ratcliffe, *et al.*, Slocan City.

The granite is traversed by many porphyry dykes, some of considerable width, and also by quartz veins carrying argentite, or silver sulphide, and varying values in gold.

This vein, running about east and west, was dipping northerly into the mountain at a very low angle, or at a dip of 10° to 15°, and an incline had been sunk about 115 feet, but not all along the vein, as this was found to be faulted up 3 feet, and 15 feet further again faulted 8 feet along the same direction of throw, while a third fault had been struck. The vein was 12 to 20 inches wide, of honeycombed quartz, with argentite disseminated through it in crystalline form, and considerable ore had been stoped, hand-sorted, and shipped to the smelters, which returned high values in silver and good gold values, as 7 tons shipped to Pilot Bay in 1895 gave 163 ounces silver and $16 in gold per ton, and 12 tons more recently, 206 ounces of silver and $26 in gold per ton. This winter work is being carried on, but little has been done to develop the veins found on the other claims.

OTHER CLAIMS.

The Meteor, ¼ mile north-east of the Howard Fraction, and bonded to Jno. A. Finch and Sheran, has also a good vein of this "dry ore," which was being opened up and prospected during the last fall.

The Silver King, 1 mile south-east of the Howard Fraction, owned by C. Faas and M. Heckmann, has a 120-foot cross-cut tunnel heading for a vein.

The *Crusader Group*, owned by C. Faas, R. N. Clay, *et al.*, Slocan City, comprises the Crusader, Boulder, and Hidden Treasure, up the first north fork of Lemon Creek. Float having been found, trenching was resorted to, resulting in the discovery, within the walls of decomposed granite, of a vein 2½ feet wide of cellular, coarsely-grained crystalline quartz, with coarse particles of silver glance and iron pyrites, some native silver and gold. A shaft has been sunk 33 feet along this vein, and this autumn one-half interest was sold to W. H. Hellyar and W. H. Smith for $12,500, and supplies were to be packed up to keep 4 or 5 men at work all winter.

The Alpine Group, embracing the Swiss, Highland Chief, Burn, and Kootenay Pass, is located high up on the mountain side above Summit Creek, the south fork of Lemon Creek, and has a strong gold-bearing quartz vein 2 to 3 feet wide, lying very flat, and traceable through three basins. But little work other than assessment has been done, and the owners, C. Faas, H. Cleaver, *et al.*, have lately bonded these properties to A. B. McKenzie and A. Dick, of Rossland.

The *Monument Group* of claims is located near these properties.

The Ocean Group is located 3½ miles north-east of the Crusader group, and west of the glaciers on the summit from which flow Kokanee Creek, south fork of Kaslo Creek, east fork of Ten-Mile Creek, up which runs the trail from the Enterprise mine road, and the main branch of Lemon Creek. This group of three claims lies at an altitude of over 8,000 feet, and of course above timber line, and the ledge is said to be a dyke mineralized with silver glance and galena. The owners, W. R. Young, W. R. Richmond, *et al.*, New Denver, have bonded ¾ of the claim to Alex. Dick, of Rossland. Many other claims are located in the vicinity, such as the Magnet, Big Four, Heather Bell, Three Guardsmen, Clipper, Boomerang, and U and I, upon the latter of which is reported to be a vein 3 to 4 feet wide of concentrating ore carrying argentite, grey copper, and galena.

The *Ottawa Group*, north of Springer Creek, is being developed by F. C. Reilly for a Winnipeg Company.

Evening Star No. 8, owned by Geo. A. Petty, of the "Monitor" mine, Three Forks, situated on Dayton Creek, a south branch of Springer Creek, sent out five tons of ore this Autumn, and 2 or 3 men are at work.

The Victoria Group, also near Dayton Creek, and 2½ miles from Slocan City, is under bond to D. Bremner for $26,000, and has a vein of "dry ore."

Republic Group, embracing the Republic, Bell No. 2, and American Eagle, located 1½ miles N. E. of Slocan City, is under bond to W. L. Parrish and W. J. Lindsay for $25,000, and a shaft is being sunk on the vein, 1½ to 2½ feet wide, of quartz, carrying silver galena and iron pyrites, and also gold.

The Slocan Bob, ½ mile east of the Republic, has sent out a ton of ore for trial test, and is being worked by the owners, who live in Vancouver.

The Chapleau, near Dayton Creek, has shipped out 4 tons of sorted dry ore to the smelter, that returned 3.6 ozs. of gold, and 94.7 ozs. of silver per ton.

The Skylark and Ranger adjoining it, are bonded for $40,000 to Alex. Dick *et al.*, of Rossland.

Other claims are under bond, and considerable work is being done this winter to prospect them.

On the Divide, at the head of Yuill Creek, reached by a trail 12½ miles long, up that creek from Kootenay River, between Nelson and Balfour, a large number of claims were located during the past season, and prospectors are awaiting the coming summer to resume the search for veins of both galena and "dry ore," now being found there in the granite.

The *Florence*, *Molly Gibson*, *Aspen* and *Achilles 200*, have been bonded to the Hon. Rufus H. Pope, Cookshire, Que., and this winter 12 men are engaged prospecting these new finds.

MAPS.

An excellent sketch map of this part of the Slocan District has been prepared by Mr. Wm. Thomlinson, of New Denver.

Cariboo Creek.

Twenty miles south of Nakusp, Cariboo Creek, on the east side of the river, flows into the Columbia at a small settlement, Burton City. A trail leads thence through an area of granite 6 miles to the junction of Mineral Creek, at point known as Mineral City, and thence trails lead farther on up Cariboo Creek, crossing over to Snow Creek, and also up both sides of Mineral Creek, one crossing over the divide to Blue Grouse Creek. Most of the area is the regular Slocan granite, but isolated areas of stratified rocks as slates, etc., can be seen, especially up Mineral City. A number of properties are reported to have been sold during the past season, and much more work will be done this year, to prospect many of the claims now located.

The *Promistoria*, owned by B. C. Rod *et al.*, Nakusp, is located high up on the west bank of Mineral Creek, 2½ miles from Madden's Hotel at the junction, and it is in slates, silicious limestones, etc., is a quartz vein, strike east and west, dip 80° S., carrying pyrrhotite, iron and copper-pyyrites and gold, of which high assays have been obtained; the returns from a nine-ton lot sent to the Trail Smelter, being authoritatively stated to have yielded $60 per ton in gold. This vein can be traced for between one and two thousand feet, and in a 75-foot tunnel it occurs as a small vein, with stringers running into the country rock, but in an open cut a short distance above, appear to be two quartz veins, one 4½ feet, the other 3 feet wide, coming together just at the surface, or else to be a horse of the country rock with this amount of mineralized quartz on either side. Considerable of the ore was piled up, some sacked for shipment, and near by these workings was a cabin.

The *Gopher* is the western extension of the vein, and the *Oro Grande* the eastern, but little work had been done on either claim.

Located along the trail on the east of Mineral Creek are:—

The *B. C.*, owned by Louis Sherrier, Hugh Madden, *et al.*, on which a narrow quartz vein is found in a line of break in the slates, along which break the country rock has been ground and crushed into a black mass, in which are small stringers of quartz. A shaft had been sunk 25 feet in this material, and then drifted in for 12 feet, showing some sulphide-bearing quartz, the value of which was not learned.

Several claims along this ridge were being prospected, and on the top of the ridge, 6,500-6,800 feet altitude, in the granite were several quartz veins carrying but a small amount of sulphides, and whose value had never really been determined.

The *Heather Bell*, owned by H. McLennan, *et al.*, had a small vein of white quartz, 3 to 12 inches wide, and on the—

Bonanza, owned by A. McPherson, F. G. Farquier, *et al.*, in an 8-foot hole, were two small quartz veins, carrying coarse crystalline pyrrhotite, but no values were ascertained.

The *Flora Mac* has two parallel quartz veins carrying very little mineral, with a strike north and south, and on the—

Noble Four a little work had been done in a mass of decomposed material, in the granite, but little idea could be then formed as to what this indicated. Both of these claims lie on the slope above Blue Grouse Creek, and are owned by H. McLennan and Alex. McDonald.

The *Hardy*, alias Golden Eagle, one-half mile east of Mineral City, has a quartz vein 8 to 10 feet wide, strike N. W. and S. E., with a mineralized streak 10 by 18 inches wide, along the hanging wall. An opening, about 20 feet deep, had been made, but the material extracted was said to assay very low in gold.

The country further east was not seen, but a large number of claims have been staked, on some of which the discovery of galena was reported, such as—

The *Independance*, four miles up Cariboo Creek beyond Mineral City, owned by A. Moore, Burton City, on which is said to be a large body of quartz, interspersed with pyrrhotite, iron pyrites and galena. No work was being done.

The *Eureka*, 2½ miles farther up the creek, owned by Jas. Durham and Wm. Swan, who were preparing to run a 100-foot tunnel on a ledge showing 6 feet of quartz and sulphides, on the northern extension of which vein are the *Shamrock* and *Black Dwarf*.

Many locations have been made on Snow Creek, but all of this part of the district is awaiting the results of further work and prospecting, and at present not much more can be reported.

Nelson Mining Division.

The Town of Nelson is not only the oldest in this part of West Kootenay, but one of the most important by reason of its situation on the West Arm of Kootenay Lake, and its railroad facilities, by which, coupled with those afforded by the steamboat lines, any point in these regions can now be quickly reached. Besides the Government offices, Court house, and Customs house, there are two banks, the Bank of British Columbia, and the Bank of Montreal, post office, express office, two newspaper offices the "Miner" and "Tribune," hotels, schools, churches, &c., and during the past year many new buildings, for business purposes and residence, have been erected. The smelter of the Hall Mines Co., Ltd., is also located here.

THE NORTH FORK OF THE SALMON RIVER.

Being desirous of giving some information in this Bulletin concerning this recently prospected country, Mr. McConnell, of the Dominion Geological Survey, was requested by the writer to give a sketch of the geological formations and the character of the ore deposits, and the following is his kind response :

"The ore-bearing rocks on the North Fork of the Salmon, consists of porphyrites, gabbro diabases, and slates, cut by numerous dykes, the whole forming a complex series somewhat similar to that of Rossland. The ores resemble the Rossland ores, but no large body had been opened up at time of my visit. A small opening on the 'Mersey,' showed several inches of nearly pure pyrrhotite with some chalcopyrite next the hanging wall, bordered by 3-4 feet of mixed ore and country rock. At the 'Ben Hassen,' the development work consists of a shaft 25 feet deep, and a drift of 8-10 feet to the east ; the ore here is principally pyrite and galena, with some chalcopyrite, and occurs disseminated in grains, small pockets and stringers, through slates and porphyrites, along a zone 12-15 feet in width. At the 'Arnold,' a shaft 25 feet deep, has been sunk through altered and silicified porphyrites, carrying galena, pyrite, blende, and chalcopyrite ; the lead is not well defined. A large number of claims have been staked out in this district, but with the exception of those given above, but little work has so far been done on them.

"On Wild Horse Creek, east of the Nelson and Fort Sheppard R. R., the conditions are somewhat different, the volcanic rocks being largely replaced by argillites striking in a north and south direction : the slates are cut by a number of quartz leads, but the only one of note visited was the 'Elise,' situated on Huckleberry Creek, a tributary of the Wild Horse Creek. An open cut on this claim, about 35 feet long and from 8-10 feet deep, shows a well-defined quartz lead from 3-5 feet in width, striking about N. 25 E., and dipping to the north at an angle of 65°. The quartz carries galena, iron, and copper pyrites, blende, and native silver. Several tons of the ore have been shipped from this mine, and is reported to have yielded 60 ounces in silver and a few dollars in gold to the ton. Claims have been staked on a number of the other tributaries of the Salmon, but I had no time to examine them."

THE HALL MINES COMPANY, LIMITED.

SILVER KING.

This company now owns 18 claims, of which 9, or 196.6 acres, are Crown-granted, and the remainder, or 312.8 acres, mineral locations. Not all these claims are on the silver-copper belt, but the *Silver King*, *Kootenay Bonanza*, *American Flag*, and *Koh-i-nor*, or 56.9 acres, constitute the group upon which the extensive mining operations are being prosecuted, to be described below, while the Brittania, Eureka, J B.D., Grand, Rose, Thistle, and Shamrock are locations close by on the gold belt, in the same geological formation. The main group of four being old locations, or made in 1886-7, possess apex rights, and are located on Toad Mountain, 5 miles from Nelson, or 8½ miles by waggon road.

Owned by the Hall Mines Co., Limited, London, Eng. Capital, £300,000, of which 50,000 £1 shares are cumulative preference shares, one-half of which were issued when the company was formed, and 250,000 of £1 ordinary shares. Sir Joseph Trutch, K.C.M.G., chairman ; F. Ramsay, 111, Wool Exchange, Coleman St., London, E. C., secretary.

Canadian officers: Gen. Manager, H. E. Croasdaile; Mine Superintendent, M. S. Davis; Smelter Superintendent, Paul Johnson; Foreman, W. A. Turner, Nelson, B. C.

FORMATION.—This copper-silver lode is situated in the greenish diabases that, in proximity to the vein, are generally massive, but also schistose, the planes of the schistose lamination being nearly vertical, and also nearly parallel with the trend of the ore zones that strike east and west, magnetic, and dip south 70°. In the main workings of the big lode no distinct walls can be seen, but in the largest stope the highest grade ore had lower grade ore receding from it on either side, indicating that probably the ore-bearing solutions had permeated and impregnated the country rock on both sides of the channel or crevice up which they had risen. In several places could be seen where the solutions had evidently followed divergent crevices and formed local impregnations leading off from the main ore body. Several fault planes of different strike and pitch traverse the lode, but with, as yet apparent, a very small amount of dislocation.

As yet but one large ore-shute, 200-225 feet long, extending right to the surface, has been developed by the present workings, but smaller ones have been found, that on further exploitation, hardly yet begun, may expand to much larger dimensions.

Towards the east, on the Kootenay Bonanza, surface showings lead to the inference that the vein may have branched, one continuing along the main direction into the Grizzly Bear ground, the other turning more to the south-east along the Kootenay Bonanza, but having apparently a dip opposite to that of the main lead. However, further work this winter to thoroughly explore this particular part of the property, may serve to show up the true conditions. This lode has been traced almost continuously throughout the length of the Silver King and Kootenay Bonanza claims, or nearly 3,000 feet, into the claims at either end, but the width of course varies greatly, from 1 or 2 feet up to the maximum, so far shown, of 50 feet.

ORE.—The ore may be graded into two classes; (*a*) into that carrying a high percentage of value-bearing sulphides, and (*b*) lower grade country rock impregnated with a much smaller amount. In the upper workings of the mine, down through a rich zone in the shute, the ore consists of bornite, or "pea-cock copper," with some tetrahedrite, also copper- and iron-pyrites, and small amounts of galena and blende, and of this ore the former owners shipped 206 tons, that averaged 190.9 ozs. in silver, and 18.17 % copper: one lot of 18.7 tons yielding 286 ozs. silver, and 27.2 % copper; and another of 13.5 tons, 321.5 ozs. silver, and 31 % copper. The present company, before the erection of their own smelter, shipped 1,160 tons of sorted ore that averaged 119 ozs. silver, and 12.9 % copper.

When the company's smelter, at Nelson, was put in blast, there were accumulated several thousand tons of good grade ore, of which over 5,000 tons assayed at the mine 46.44 ozs. silver, and 5.92 % copper, which yielded a very high grade matte when smelted. Since then, as will be seen by the total of production below, the grade of the ore has fallen considerably for two reasons:—(*a*.) As much lower grade ore can now be profitably treated, much rock hitherto profitless has been and is mined, increasing the tonnage but pulling down the average value, or for 15,000 tons mined in 1896, the mine assays were 20.52 ozs. silver per ton, and 3.64 % copper. (*b*.) The bulk of the highest grade ore in the present ore-shute, so far developed and accessible to mining, has been mined out leaving a large body of the lower grade, but still a considerable amount of the rich ore. The thorough development and prospecting of this property can be said to be now well inaugurated, and the exploitation of the present ore shute and other shutes, in depth disclosed by the diamond drill, can now be properly undertaken and vigorously carried on.

In the lowest workings of the mine the ore appears to be changing in that chalco-pyrite is replacing the bornite. The diabase country rock in the ore shute is impregnated with the metalliferous sulphides and some quartz. With an increased amount of gray copper in the ore, the silver value rises. At the surface the sulphides have been oxidised to a brown or black gossan, stained by the green and blue copper carbonates, and this gossan evidently contains much manganese, as the ore carries a good percentage of this metal. (*See* smelter analyses.)

Production of Mine.

The following table gives very closely the total production of the mine from the beginning of work to January 1st, 1897 :—

	Tons.	Ozs. per Ton Silver.	Copper.	Silver ozs.	Copper lb.
Amount shipped by former owners.	200	190.0	18.7	38,000	74,800
do " to outside smelters.	1,160	119.0	12.9	138,331	299,400
do " to Company smelter	29,860	21.0	3.7	627,060	2,209,640
Total production of mine....	31,220			803,391	2,583,840

Production of Smelter.

Mr. Paul Johnson, Superintendant of the smelter, reports that from Jan. 14th to Jan. 1st, 1897, the smelter has been in blast for 255½ days, and that with the one 42 by 100-inch blast furnace there have been smelted :—

Ore Smelted.

Silver King ore........	59,720,335	lbs. or	29,860	tons of	2,000 lbs
Outside ores	512,070	"	271	"	"
Total ore.............	60,262,405	"	30,131	"	"

Production.

	Pounds.		Silver ozs.	Gold ozs.	Copper lbs.
Matte and metallics...	4,775,355	containing	628,125	575.2	2,247,891
Flue dust	240,000	"	4,836	2.9	15,030
Totals	5,015,355		632,960	578.1	2,262,921

The average value of the ore. From the above returns the average silver and copper contents yielded per ton, as calculated from the product obtained in smelting nearly 30,000 tons of the Silver King ore are nearly :—21 ounces of silver per ton, and 3.7 copper.

Dividends.

No dividends have been paid by this company. As in all other mining propositions, the strictest economy and the most careful and experienced management will have to be exercised before profitable returns will accrue to the stockholders.

Mining Operations.

All mining work, apart from prospecting, has been done on the Silver King lode which runs through the Kootenay Bonanza and Silver King claims, and especially upon the large ore shute on the latter claim. Further and extensive underground development work now in progress, should serve to locate and determine the size and value of the ore-shute, and to give more points of attack, with the consequent increased daily tonnage of ore.

About $104,000 were spent by the former owners, the Kootenay Bonanza Co., in prospecting this main ore-shute near the eastern end of the Silver King, by driving three tunnels, or 1,100 feet, numerous cross-cuts or 345 feet, and sinking winzes, etc., and the present company has utilised and extended these workings, exploring also extensively with the diamond drill. The following will give some idea of the present workings, and the size and extent of ore bodies now disclosed :—

Silver King.—Tunnel No. 1, 85 feet long, near the crown of the hill, is not being used, but some very good ore was disclosed, particularly in some short winzes.

Tunnel No. 2, 132 feet, is a short distance below No. 1, and 44 feet above No. 4, to the large stopes, from which it is connected by two winzes, down which the ore is sent in mill holes to the main haulage system. A large amount of very high grade ore has been taken from this level, and at present a considerable amount of medium grade ore is being mined, but the bulk of the ore now exposed is below.

Tunnel No. 4, or Main Tunnel, 6 by 7 ft., is at present the main artery of the mine, and was run by the former company 912 ft. easterly, in a straight line, nearly along the course of the ledge, but directly through the main ore-shute, at 720 feet it passes into the Kootenay Bonanza ground, 270 ft. vertically below the surface, while its face is still 600 ft. west of a shaft on this claim, to be described below, where are excellent surface indications of ore, 290 ft. above the tunnel level.

In driving this tunnel no ore was found for 85 feet, when a small amount of mixed ore was followed until, at 175 feet, 3-4 feet of good ore came in, down in which a winze is now sunk 70 feet, along which, and a 100-foot drift, are 2-3 feet of good grade ore, belonging, apparently, to a different shute from the main one. At this point a hoist, run by compressed air, was being installed to facilitate sinking, as this will form an important connection with the new tunnel, No. 5, by the time this reaches this point over 200 feet below, beside permitting in the mean time the opening up of this section of the lode. From this on there is little ore showing in the tunnel, until at 345 feet it enters and traverses for over 200 feet the magnificent ore-shute that extends right to the surface through upper tunnels, but appears to have its greatest width at this level. At first a core of 6-9 feet of very high grade ore was mined, but since then ore of lower, but very profitable, has been mined on either side, until this stope is now 35-50 feet wide and up 35-40 feet, showing a large amount of the medium to good grade ore 15-30 feet wide in the roof, besides that below the floor, but at either end this shute is narrowing down to a width of a few feet.

This large stope is being very well timbered up with square sets of 12-inch squared timbers, 6 by 6 by 8 feet, with strong floors; and this will not only make this ground safe, but render easy the catching up of the ground when the ore is stoped out from below this level, but so far the ground is very solid, and no timbering is required, except in these large openings or at the tunnel entrances.

From this main tunnel level another winze or incline, 135 feet deep, 250 east of the first ore described, is being sunk near the hanging wall and about half way along this large stope (by the aid of machine drills and a compressed air hoist) from which run two levels; No. 2 at 30 feet, with 170 feet of drifts and 60 feet of cross-cut; No. 3 at 60 feet with 75 feet of drift and 110 feet of cross-cut. Both of these levels are connected by another winze from the tunnel level, and up from each considerable high grade ore has been stoped out, leaving 12 to 15 feet of the lower grade. At the bottom the winze has run into the foot-wall, and at 135 feet prospecting at this level was just being commenced.

Thus the ore-shute, developed to a depth of 260 feet, has been shown to be in the present workings, about 225 feet long and 50 feet at its widest, and it is believed to have on its dip a trend to the east, as the workings and bore holes seem to indicate.

In the continuation of tunnel No. 4 there is no ore, this working being south of the lode, but 30 feet in one cross-cut north and 50 feet from the big stope, is a body of good ore, 10-12 feet thick, which is again struck in a diamond drill-hole in another cross-cut north, 100 feet east of this, and is there about 6 feet thick. This tunnel, after being deflected into the course of the lode, should be continued through the Kootenay-Bonanza, at least 6-800 feet.

Tunnel No. 5, or New Tunnel, 300 feet west of the No. 4, and 210 feet vertically below, or 230 feet on dip of the lode, follows for some distance a zone 2-3 feet wide of mixed ore, carrying more galena than found in other workings on the Silver King. This vein has a strong outcrop and runs through the Dandy claim, and in all probability is the extension of the Silver King lode, only it appears to be located about 150 feet north of where this lode should be by continuing its course as indicated in the upper workings. This tunnel, 6 by 7, double-tracked, now in 360 feet (Oct. 17th), is being advanced by using two machine drills, one Ingersoll-Sargeant, and one Rand, and 5-600 feet yet intervene before it will be into the big ore shute, but a large amount of ground can be prospected by this working, and much stoping done above it, while the handling of the ore will be rendered very simple, as the cars from this tunnel are run directly to the top of the ore bins of the aerial tramway.

KOOTENAY BONANZA.

On this claim a shaft 65 feet deep, with 120 feet of cross-cuts, now being enlarged for extended prospect work this winter, disclosed a considerable amount of good ore, and 100 feet east, in a small open cut, is some high grade ore believed to be in the continuation east of the Silver King lode, while south of this shaft, extending to the east end of this claim, exposed by a number of trenches, runs a mineralized zone, S. 40° E. (mag.), cutting across the stratification of the schists S. 80° E. (mag.) The rock in this zone is solid, light coloured, fine grained, and impregnated with copper pyrites, bornite, and a little galena and grey copper, with quartz stringers, while the country rock is very schistose. It was here that the first copper-stained surface rock was found by the locators, and although drill-holes have been put down here, more satisfactory knowledge is expected to be gained this winter by drifting from the shaft, and if with favourable results, tunnels Nos. 4 and 5 can be pushed on into this ground.

MINING MACHINERY.

Large and commodious buildings at the mouth of No. 1 tunnel were being completed, in which were engine, compressor and boiler rooms, sorting floors and blacksmith shops, &c. The plant consists of:—

(*a*.) 1 Corliss steam engine, 16 by 36, made by Albion Iron Works, Victoria, B.C.;
2 60-H.P. boilers made by Ingersoll-Sargeant Rock Drill Co., Montreal; and
1 35-H.P. boiler with boiler feed pumps;
1 10-drill air compressor, 18 by 24, Ingersoll-Sargeant, Montreal;
1 2-drill 〃 〃 〃 〃

(The engine fly-wheel is 12 ft. by 22 inches, with belting to pulley on shaft, whence another belt from the driving pulley runs back to fly-wheel of compressor, 10 ft. by 18 inches.)

(*b*.) Work shop, with lathe, &c.:

(*c*.) 1 No. 3 Gates rock-breaker, in which large stuff is thrown from sorting floor, thence to bins for the 3-rail gravity tramway; also a small Dodge crusher for breaking the samples for assay:

(*d*.) Saw-mill, with planer, &c.

The compressed air, at 80 lbs. pressure, is conveyed through the tunnel in an 8-inch spiral riveted steel pipe, thence by iron pipes and hose to the drills, which are used in driving headings, all stoping being done by single-hand work. The fuel, or cord-wood, costing $1.25 per cord, is cut on the property.

TRANSPORTATION.

(*a*.) Ore from Tunnel No. 2 is trammed in cars to the shute down to Tunnel No. 4:

(*b*.) From shutes on No. 4 level all ore is trammed out to the sorting floor, from the bins below which—

(*c*.) The ore is loaded into trains of three cars, each holding 1,350 lbs., which are pushed out by two men and attached to the rope of the gravity tramway:

(*d*.) This 3-rail tramway, equipped with $\frac{3}{4}$-inch steel cable and a 3-brake drum, runs down a trestle 700 feet long, dropping 190 feet, to the ore bins, 3,000 tons capacity, of the aerial rope-way, into which bins the cars from Tunnel No. 5 empty directly:

(*e*.) The Hallidie Aerial Rope Tramway had to be divided into two sections, as the total length and drop were so great that the rope, as it went over the pulleys on the bents, cut right through these and also cut off the bucket-clips so that sometimes 25 to 30 buckets could be seen lying in the snow. By division this trouble has been greatly obviated, and this simple rope system is now doing very satisfactory work, while its length and amount of fall should be of interest to all mining men concerned with the transport of ore. The following are the data:

TOTAL LENGTH—23,250 feet, or 4.4 miles.

Length of upper section	10,200 feet.
〃 lower 〃	13,050 〃
Total difference in elevation between terminals	3,750 〃
No. of bents	145
Longest span	700 feet.
Diameter of steel rope	1 inch.
No. of buckets	850
Capacity of each bucket	150 to 165 lbs.
Best capacity of tramway to date for 10 hours	145 tons.
Average	132 〃
Total cost, about	$50,000.

As there are no automatic devices for loading or unloading buckets, a large number of men is required, or at upper end 6, division station 7, lower end 2, line workers 2, total; 17 men.

The life of the present rope will be about one year, or guaranteed by the builders for 35,000 tons.

Timber.

There is a considerable amount of good mine timber below the mine on the Company's property, but not much above.

Water.

Water, so far, gives but little trouble in the mine, but at the face of No. 4 tunnel, water under a high pressure, was struck in a drill hole, into which is now fastened a 2-inch pipe, through which very good water, under a pressure of 120 lbs per square inch, is carried to the boilers and other places outside. The mine water is non-corrosive and quite fit for boilers. The supply of surface water is limited but adequate.

Diamond Drilling.

It is stated that over 22,000 feet of holes have been drilled by this company by means of the steam-actuated diamond drills, and of this 11,000 feet by the present management (Mr. Fred. Stone), who are now contracting all this work at $1.15 per foot. The rock is very suitable for this work, and very long cores are extracted except when passing through ore or rock containing a large amount of sulphides, and then all the material grinds to sludge. This lode has been prospected by setting up the machine on the surface, then drilling 2 or 3 holes at right angles to the strike of the lode, but at angles of 45° to 70° from the horizontal, thus intersecting the ore body in 2 or 3 points from this one set up. Also the drill has been used with greater satisfaction in the under ground workings, where the work can be done at more direct angles to the ore body, or rather ore bodies, as this prospecting has shown the existence of 2 and in some sections 3 parallel lenses of ore of some thickness.

The writer did not ascertain fully the results of these borings, but they are reported by the management to be very favourable.

Mine Buildings.

Besides the engine buildings, the log boarding and living houses have been this year replaced by new buildings built of material cut at the mine saw-mill, and among these are the following :—

(1.) Offices and superintendent's residence.

(2.) Assay and chemical laboratory.

(3.) Powder magazines.

(4.) House for foreman.

(5.) 3 double houses to be rented to the miners with families.

(6.) A large boarding house, 100 by 32½ feet, with kitchen, 17 by 32½ feet, three stories high with large basement. Masonry foundation, lathed and plastered, heated by furnace, and supplied with hot and cold water. For rooms and accommodation in this most commodious building the miners will be charged, besides the rate for board, which will be under the control of the company.

(7.) Stables, sheds, out-houses, &c.

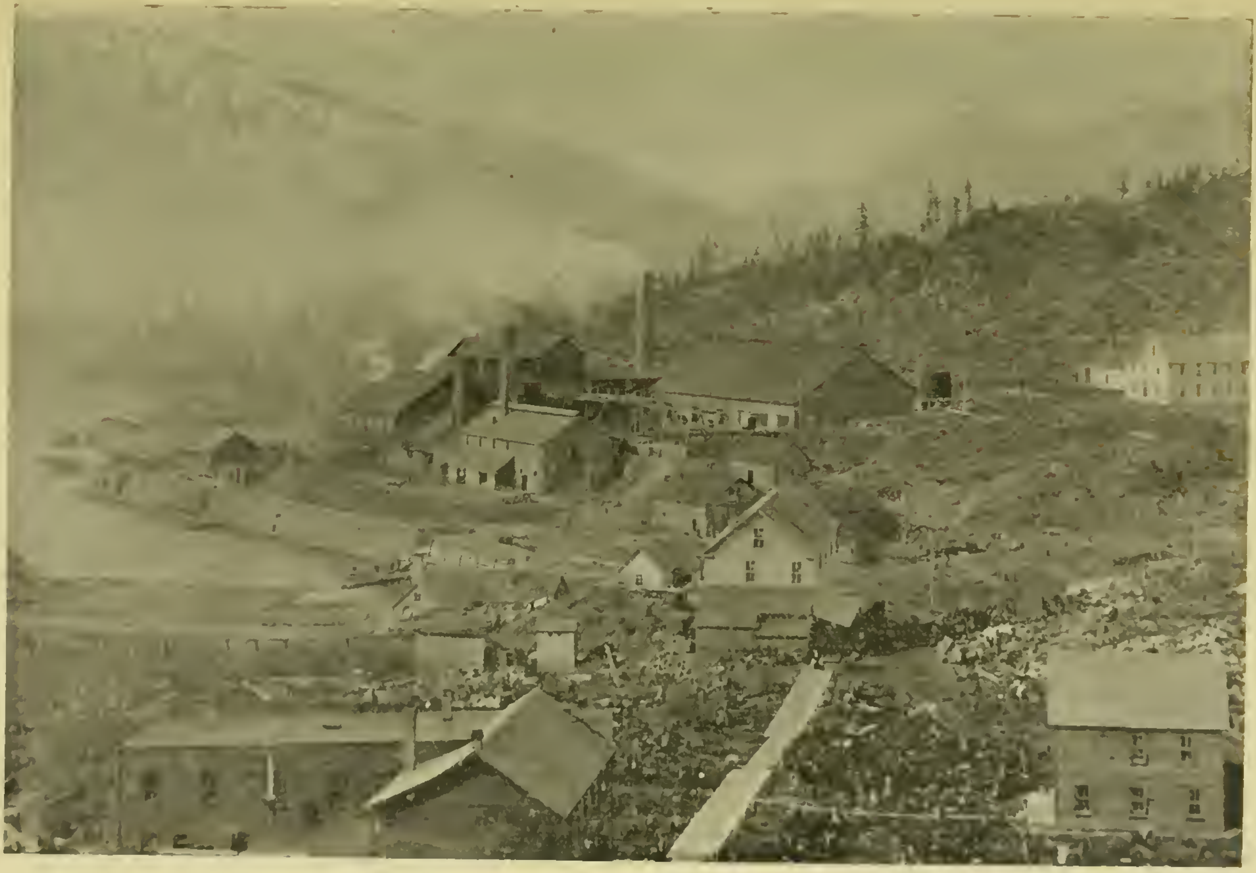
Wages and Costs of Mining.

The number of men engaged at the mine was 160, but on completion of the buildings, this was to be reduced to 120. For 10-hour shifts miners are paid $3.00 ; topmen and rustlers, $2.50 ; bosses, $4.00 to $4.50 ; blacksmiths, $3.50 to $4.00 ; engineers, $100 per month.

Cost of driving tunnels, $9 to $10 per foot ; cost of breaking and delivering ore at upper terminal of aerial rope tramway, $2.50 per ton ; cost of transport of ore by tramway, including cost of rope, wear and tear, &c., 75 cents to $1.00.

The Smelter at Nelson.

The smelter built by this company near the lower end of the tramway, on the outskirts of Nelson, and ¼ mile from the Kootenay River, was first blown in Jan. 14th, 1896, and has been in blast for 255½ days. At tramway terminal are 7 bins of 1,000 tons each, from which ore is lowered by a 2-car gravity tramway 400 feet long to the smelter ore-bins.



PILOT BAY SMELTER, KOOTENAY LAKE.

(See page 94.)

Furnace Room.—There is one water-jacketted blast furnace, 42 by 100 inches at the tuyeres; tuyeres 3 ft. 8 in. from floor; feed floor 17 ft. from floor; water jackets 4 ft. 6 in. high and of steel; 6 tuyeres of 3 in. nozzle on each side. At the time of visit the ordinary solid foundation hearth had been replaced with a removable crucible, consisting of a steel plate frame 21 inches high, on a strongly braced cast-iron bottom, laid with cold water pipes in the tightly rammed steep, on which are laid fire bricks on end, 3 inches below the water-jacketted tapping-hole. This crucible is mounted on jack screws with a 6 inch play, on a strong carriage on rails running lengthwise under the furnace and extending each way, the track at the back of the furnace carrying a duplicate hearth, while covered in front with iron plates, thus permitting the quick replacement of a hearth that is pushed under and jacked up snugly against the water-jackets, suspended by legs and hangers from the I-beams.

The fore-hearth is mounted, 5 feet square, 2 ft. 6 in. deep, lined with common red brick, and the slag runs into a large wheeled slag pot, which traps a small amount of matte, but more especially provides for accident, in case there is delay in tapping the fore-hearth, and thence drops 4 feet from a long iron spout into an iron lined water box to be granulated and swept out to the dump by the rapid stream of water. From the tap-hole of the fore hearth, the matte runs along an 8 ft. solid iron gutter, to a series of moulds on a carriage, 18 in. by 12 in. by 8 in., holding 220 lbs. of matte each, into which, while molten, is stuck an iron hook, for convenience in lifting afterwards.

Another furnace, designed by Mr. Johnson, with same kind of movable hearth 44 by 144 inches at tuyeres, capacity over 200 tons per 24 hours, 8 tuyeres on each side, with a bosh both in the stack and the water-jackets, is being erected, while the building is so arranged that 5 stacks in all may be put in easily.

This new furnace, by means of the mounted hearths, may be utilised for lead smelting, by replacing, in a very short time, the crucible for copper work by one suitable for lead smelting.

Dust Chambers are of brick on a stone foundation, 175 feet long, 8 feet wide, 10 feet high, leading to a stack 177 feet high from the base, but nearly 200 feet above the furnaces, built of red brick (from Spokane) on a granite foundation. Most of the dust collects in the front part of the chamber, and in the two pyramidal hoppers in the iron downtake. (See below for analysis of flue dust).

Engine Room contains at present a temporary plant of an 80 h. p. engine, 14 in. by 18 in., operating a No. 6 Root Blower; a 5 by 16 feet tubular boiler, feed pumps, etc. This building is to be extended for the installation of another engine and blower, that are to be so combined as to be on the same bed-plate. By the C. P. R. trestle, the fuel (wood) is brought to the door.

Water.—A solid masonry reservoir, built in a very favourable basin in the granite, capacity, 150,000 gallons, 50 feet above the smelter floor, is fed by a small stream, but to insure a proper supply of water—in case this source should fail, a large wooden tank stands on the end of the railway trestle, and is kept full by a small steam pump down on the bank of a constant-flowing stream below.

The Sampling Works, 40 by 60 ft. two stories high, have the upper floor so that barrows can be wheeled directly into the railway cars, to load matte for shipment, or unload ore from other mines. The crushers and rolls are placed up on the floor, so that all material has to be lifted by hand when feeding, and (*a*) for sampling matte there are a Blake crusher 15 in. by 24 in., made by Ingersoll-Sargeant Rock Drill Co., Montreal, and a Cornish rolls, 15 by 30, made by Jenckes Machine Co., Sherbrooke, Que.; and (*b*) for sampling ores a crusher 10 by 18, Fraser and Chalmers, and rolls 10 by 18, Jenckes Machine Co. The ore is wheeled to the sampling floor covered by iron plates and quartered down.

Bins.—Besides the bins at the tramway terminal, there are bins for the coke, iron ore, fluxes, limestone, ore from other mines, and for the mine ore.

Refinery.—This part of the smelter will be included in a 60 by 100 foot building, 25 feet to the eaves, and comprise (*a*) a Reverberatory calcining furnace, hearth 16 by 50 feet, fuel, wood, and (*b*) a Reverberatory smelting furnace, hearth 13 by 17 feet, or 16 by 20 feet, outside measurement, both furnaces being built upon a foundation made by filling in excavations of the proper size with molten slag, and connecting with a 65-foot stack.

In the smelting furnace it is proposed to reduce the calcined matte to blister copper, or 95% copper, and 2% silver, the fuel to be soft coal.

On blowing out the furnace in September, prior to putting in the removable hearths, a large mass of metallic copper, very rich in silver, was found filling the bottom of the furnace and also eating into the bottom, extending down to the ground by replacing the mortar between the fire bricks and a steel plate with metallic copper. This valuable mass was broken up, after a great deal of trouble, by using dynamite pop-shots, and now several large pieces will be easily handled by being put on the hearth of the furnace before the arch of the roof is turned, and then melted down.

The offices and laboratories are excellent, and with the completion of the additions now being made, the company will possess a very complete and excellent smelting plant, designed and constructed by Mr. Johnson, who has added to his already high reputation, by the success he has met with in his treatment of the Silver King ore, and further—with the mine well laid out and thorougly equipped, and means of transportation good, this company should be in position to thoroughly explore their property and mine on a large scale.

Fuel.—Both American and European coke are being used, and of the latter quite a large quantity has been imported this fall.

(*a.*) The American coke, from Wilkington, Wash., contains, as nearly all similar coke made from the coal measures of the Cretaceous, a large amount of ash, or 18-19%, and costs delivered at the smelter $13.40 per ton.

(*b.*) The Welsh or Cardiff coke is being delivered at the smelter for $15 per ton, and over 4,000 tons were in stock. In the furnace on an average 11% of this required.

(*c.*) 700-800 tons of Westphalian coke has been imported and landed at the smelter at a little less cost than Cardiff; these cokes having been sent out by sea to Vancouver.

Fluxes.—A very pure limestone, crystalline, is brought down on scows from 9 miles above Kaslo, on Kootenay Lake.

Analyses.—The subjoined analyses of the ore, matte, etc., were kindly given by Mr. Johnson:—

Ore.	1	2	3	4
Insol.	48.00	40.60	40.50	46.50
SiO_2		32.30	29.70	33.70
S.	3.70	4.39	3.00	3.00
Al_2O_3	2.37(?)	12.50		
Fe.	6.18	6.92	8.01	8.12
MnO	10.97	9.11	6.80	8.30
CaO	6.40	10.50	7.20	5.70
MgO	1.04	3.56		
Cu.	5.06	5.59	4.40	4.30
Ag.	35.05 oz. per ton.	30.00 oz. per ton.	22.08 oz. per ton.	32.00 oz. per ton.

Matte.—A typical matte assays: 175-310 ozs. of silver per ton, 45-50% copper.

Analysis:—Cu. 43.0, Fe. 19.7, S. 23.6, As. 0.06, Sb. 0.50, Mn. 4.90, Zn. 1.5, Ag. 1.0, Au. a trace (or .12 oz per ton).

The analysis of slag shows its very acidic character:—SiO_2 41 to 44%, Al_2O_3 15 to 25%, Fe. 7 to 10%, MnO. 8 to 10%, CaO. 11 to 14%, Ag. .7 to .9 oz. per ton, Cu. .025 to .035%.

Analysis of flue-dust:—Insol. matter, *i.e.*, mineral 33.9, and carbon 7.8, Cu. 6.12, As. 3.2, Sb. 2.9, iron peroxyd. 10.3, CaO. 4.7, MgO. 5.8, Al_2O_3 1.9, S. 9.52, ZnO. 3.1, Mn. traces, and Ag. 37.6 oz per ton.

Analysis of coke from Fairhaven, Wash.:—Ash. 23.85., S. 0.52., H_2O. 0.35., fixed carbon 75.28.

Transportation.—(*a.*) The C.P.R. has a spur up to the smelter, by which cars can be run to the main line that leads out to Robson, or to the wharf, where the steamers from the Kootenay Lake land:

(*b.*) The Nelson and Fort Sheppard R.R. is about 1 mile distant, to which will be built a waggon road, as by this railroad ore can now be shipped direct from Rossland.

Custom Smelting.—This smelter has now entered the market at Rossland for the gold-copper ore that can be brought to this point. Also by means of the new furnace with removable crucibles, and especial flues to be erected for the condensation of lead fumes, it is intended to undertake the treatment of the silver-lead ores, and thus make this one of the smelting centres for Kootenay ores.

ADJACENT CLAIMS.

The *Dandy*. —This claim Crown granted, 19 acres, owned by A. H. Kelly, Nelson, lies immediately west of the Silver King, on the extension of this vein, and considerable work has been performed. About 100 feet below the new working tunnel of the Silver King, and not far from the end-line, a tunnel was in 75 feet along the vein, which is here 3½ to 4 feet wide, with quartz, copper-pyrites, bornite and galena, also spathic iron. About 80 feet westerly along this vein was a shaft, said to be 47 feet deep, but full of water, and below this was Tunnel No 2, which cross-cuts for 65 feet then follows continuously 170 feet along the vein, in which there is much quartz, brecciated country rock, the copper ores and galena as found above. Still further along the vein is an open cut, 50 feet long, exposing a 3 to 4 foot vein, and in Tunnel No. 3, 170 feet long, the vein is followed for 100 feet. Considerable ore is piled on the dumps, but its value was not learned, as no shipments have been made as far as could be ascertained.

The *Iroquois*, 500 feet south-westerly from the Silver King, appears to have a parallel lead of the same character of ore, but although exploration has been carried on by means of tunnels, open cuts and diamond drill holes, a body of sufficient size for profitable working has not yet been located. This claim is Crown-granted, 15.13 acres, to Mr. J. E. Boss, Spokane.

The *Grizzly Bear*, Crown-granted, 12.5 acres, owned by the Stadacona Silver-Copper Mining Co., of Victoria, B.C., lies easterly of the American Flag and Kootenay Bonanza and adjoins them. No work was being done, but in the shaft near the westerly end there is some very good ore, as this is evidently on the easterly extension of the Silver King vein, which is traced to this point by open cuts. Farther easterly considerable work has been done to intercept the vein, but this was not successful in 300 feet of tunnelling and cross-cutting. Good cabins are on the claim, and good timber, and further exploratory work is understood to be under advisement.

On the *Silver Queen*, title, Crown Grant, 20.25 acres, owned by the Silver Queen Mining Co., Victoria, B. C., a good deal of work had been done in exploring for the branch of the Silver King lode, that is believed to run through the Kootenay Bonanza into this property. In several cuts could be seen small traces of copper minerals, and in a shaft, now full of water, it was stated that some copper-silver ore had been found, but as no work was being done on the claim, satisfactory information was not obtainable. Since the time of visit, further prospecting has been begun by the sinking of holes with the diamond drill, by the same contractor, who has done much work upon the Silver King Group. Assessment work was being done on a number of other claims, and on some are small quartz veins, carrying gold values, but concerning which but little has been really ascertained.

Gold Claims.

POORMAN GROUP.

This group consists of six claims, the *Poorman*, *Hardscrabble*, *White*, *Myemer*, *Hardup* and *Electron*, of which the first is Crown-granted, the others mineral locations. Location, on Eagle Creek, 6 miles westerly from Nelson, and about 2 miles S. E. of the Kootenay River and the C. P. R. R. Owned by N. L. Davenport *et al.*, Nelson.

Most mining work has been done on the Poorman and White claims, on two distinct quartz veins, 1,200 feet apart, strike, about N. and S., dip, easterly 40°-50°, in a greenish coarse-grained hornblendic granite.

The POORMAN VEIN has the usual characteristics of quartz fissure veins in eruptive rock, being persistent, but very irregular in width, varying from a few inches to 5 and 6 feet of milky-white compact quartz, now holding a considerable amount of sulphides, or copper- and iron-pyrites, with, in parts, a little galena. In the upper workings the ore was found to be very free-milling, and several thousand dollars worth of magnificent gold-bearing quartz was taken from a part of the vein 5-6 feet wide, but now, as depth is attained, the ore has become less free-milling, and the value is going more into the sulphides that are saved by concentration. About $100,000, it is reported by the owners, have been taken from the comparatively small area of the vein so far worked, and now the average value of the ore saved by amalgamation, is from $12 to $14 per ton, while the concentrates assay from $26 to $30 per ton, with the proportion of concentration about 10 tons to 1, so the total yield value of the ore is about $16 per ton of ore mined.

On the Poorman workings there are :—The main tunnel cross-cutting for 90 feet, following along a fault wall that faults the vein at intersection, 5 feet. To the south the drift runs about 180 feet, with ground stoped out nearly all the distance, and practically to the surface, the vein varying from a stringer of quartz to 5 and 6 feet in width, and now 6-8 inches wide in face of drift. To the north the drift is 325 feet long, with thus about 500 feet of work along the ledge, and at 30 feet is a winze 85 feet deep (full of water), in which the vein is said to average 2 ft. throughout its length, thus exploiting new ground.

There are several faults exposed in these workings, causing dislocations of a few feet, and at 110 feet, in the north drift, occurs one nearly parallel with the vein but steeper, up which the lower part of the vein has been lifted 6-8 feet. Other faults run transverse to the vein, but the throw has not been uniform in direction, being in one place to the east, in another to the west. Much stoping clear to the surface, 70-80 feet, has also been done along this drift, with an average width of about two feet, and at the face the vein is a few inches wide, but there is no reason why the vein, on continuing the drift either way, should not widen out again, as was the case several times before.

Tunnel No. 2 was in about 140 feet, having passed through a small vein from which 50 tons have been mined from a 40-foot drift and stope along it, and at 450 feet it is calculated to strike the vein 300 feet on the pitch below the upper workings.

On the *White* claim another, but smaller, vein has been exploited by a tunnel along it, about S. 25° E., 140 feet long, from which about 200 tons of ore have been accumulated on the dump, consisting of white opaque quartz containing a good percentage of very coarse iron pyrites, some copper pyrites, and in parts galena. In the altered granite country rock, are developed cubes of iron pyrites. In one place the vein was 2 to 3 feet wide, while along part of the tunnel there were two small veins, with breccia between and small stringers of quartz running into the country rock. About 80 tons of ore have been milled, which yielded, it is said, somewhat higher returns than the Poorman ore ; but this vein has not yet been really developed to an extent to give much idea of its size and value. No work was being done on the property at the time of examination.

Stamp Mill.

A waggon road, 2½ miles long, has been built from the railroad bridge over the Kootenay River, where is a magnificent water power, to the mill, and thence 2,000 feet to the main tunnel. From Eagle Creek, flowing down past the mine and mill, water is carried in an 8 by 20-inch flume to the penstock, and thence under a 200-foot head, in a 11-inch steel pipe, to the mill : but a sufficient amount of water to keep the mill working is now only obtained for part of the year, or for April, May, June, and July, when a 150 to 175 h.p. is available ; but while more water can be got by building a flume 2 miles long to Sandy Creek, it is doubtful if a continous mill run throughout the year can be got without erecting a mill at the Kootenay River, where are abundant water and power, easily accessible by waggon road. In the mill are (*a*) Blake crusher above the bins ; (*b*) two automatic feeders ; (*c*) two batteries of 5 stamps, each 850 lbs., made by Chicago Iron Works Co., with two outer copper plates 10 feet by 4 feet 8 inches, as well as the inside coppers, mercury traps, etc.; (*d*) three end-shake vanners, 12 feet by 4½ feet, smooth belts, made by the Joshua Hendy Co., San Francisco ; (*e*) a 4-foot Pelton water wheel running the mill and air compressor ; (*f*) a three-drill Rand air compressor, made at Sherbrooke, Que., with receiver and 2-inch pipe to tunnel No. 2. The mill, as well as several good cabins, stables, etc., are built of logs.

Costs of milling were not obtainable, but the ore is broken by contract for $6 per ton, embracing, it was understood, the cost of drifting, upraising, etc. The concentrates have been shipped to the Hall Mines smelter at Nelson, with a freight and treatment charge of $8 per ton, with 95% of the gold paid for.

As there was not enough water to run the compressor or mill, all work was suspended, but when tunnel No. 2 reaches the main vein a large area for development will thus be opened up, and in all probability the vein will be found to have the same character as to size as found above, only the sulphides will, it is expected, carry a larger percentage of the yield value, but as these are cheaply concentrated, and a smelter is but a short distance away, no serious results can follow this increasing refractoriness of the ore.

Other Gold Claims.

Other quartz veins have been discovered and developed to a small extent, in this same granite area on the mountain slope, south of the Kootenay River, also in the formation in which is the Silver King lode. Much attention is now being paid to other such claims, and and before long many of these will receive a thorough testing. As the water supply in the small creeks is precarious, and too small to keep mills running throughout the whole year, the Kootenay river will prove the best site for stamp mills, as there is abundant water power, although special allowance and provision will have to be made for the great difference between the high and low water stages of that river. The transport of the ore to the riverside presents no difficulties. Probably the out-put of several of these veins may yet be controlled by one company, and sent to one mill, or the ore from different claims be treated at a custom mill, as is now so often done in the West, as in Gilpin County, Colo.

As this ore will, without doubt, in depth, carry a fair percentage of sulphides, which, in turn, will hold a part of the gold values, if such ores are shown to carry pay value in this metal, the question of treatment of these sulphide concentrates should be greatly simplified by the easy access to the smelters, where low smelting charges should be the rule, and the necessity of the erection of chlorination or cyanide works, although the amount of copper present may preclude the latter, may be thus obviated In Gilpin County above mentioned, a large amount of such concentrates collected at the numerous mills at Blackhawk, yielding $18 to $90 in gold per ton, is yearly treated at the Denver smelters, at a cost that is below that of any wet or lixiviation process. In that County the ores carry a high percentage of sulphides, and after much nearly pure pyritous ore has been sorted out for direct shipment to the smelter, the ore then averages from 12 to 15% pyrites, or concentrates 7 to 1, after leaving the stamp-mill proper. However this district, apart from the experience of the Poorman mine, yet remains to be proved ; but it must be borne in mind, that in modern mill practice the term "free-milling" ore now embraces much material, that not long since would have been considered "refractory," and also, the point desired to be made, that the proximity to smelters further simplifies conditions, as what gold will not amalgamate may be retained by some simple form of concentrator, the treatment of the product of which is at once available.

The Royal Canadian Group.

About a mile west of the Poorman mine, a number of other quartz veins have been found, in the granite and on this group, the *Royal Canadian*, *Colorado* and *Nevada* claims, 600 by 1,500 feet, title, Crown Grants, have been located two such veins. These claims are along the main trail to Nelson, and about 1¼ miles back from the Kootenay River, the tunnels being close to the trail. On the Colorado, a short tunnel has been run south on a small vein running north and south, dip, easterly, 2 to 20 inches wide, of white opaque quartz, carrying some iron and copper pyrites, 15 tons of which are reported to have yielded at the Poorman Mill, $14.50 in gold per ton ; the sulphides not being saved.

On the Royal Canadian, about 400 ft. west of the Colorado tunnel, another but much stronger vein has been developed by a tunnel running south 205 feet, the vein following under a very distinct and straight hanging-wall, with a width of 6 inches to 3½ feet, average perhaps 16 inches, and yielding an ore similar to that of the Poorman, or a white sugary quartz, with 8 to 12% of iron pyrites and some copper pyrites, 60 tons of which piled on the surface, I was informed, assaying $12 to $14 in gold, while 8 samples taken by a gentleman who has a bond on this group, assayed from $8 to $51 in gold. An upper tunnel, 50 feet up and 66 feet in, shows the same vein 4 to 12 inches wide. On the Nevada, sluicing, or the cutting of surface trenches by running water, has been tried to locate the source of the quartz float, but as the surface wash is thick over nearly all these mountain slopes, no vein has yet been found. No water is nearer than the Kootenay River.

The *Muldoon*, owner, M. Monahan, Nelson, title, Crown Grant, is the south extension of the Royal Canadian, and shows in a tunnel, a small quartz stringer, with same dip and strike as the vein on the claim described.

Majestic.

Title Crown Grant, area 600 by 1,500 feet, owned by John Miles, Nelson, located south east of Canadian and about a mile west of Poorman. In a tunnel running south 120 feet is another quartz vein, 8 inches to 3 feet wide, in the granite, of a white opaque quartz with only a small amount of pyrites, the values in which could not be ascertained. About 50 feet to the west is a second parallel vein, 12 to 16 inches wide, exposed to an open cut, from which it is claimed free-gold samples have been taken.

Starlight Group.

This group of claims, consisting of the Starlight, title Crown Grant, area 600 by 1,500 feet, and the mineral locations 1,500 by 1,500 feet, the *Golden Star*, *Kootenay Star*, *White Witch* and *Black Witch*, in all 224 acres, located 4,000 feet above Kootenay River, has been attracting attention by reason of the existence of two auriferous schistose bands, one of which, running through the Starlight, Golden Star and Kootenay Star, has been exploited by a tunnel 209 feet long.

This tunnel, crossing this band at right angles, discloses a width of 148 feet of schistose rock between two porphyry dykes, and the results of careful sampling of this width of rock by Mr. G. Grant Francis, M.E., of London, England, have given the assay value in gold of this rock to be $3.00 per ton, of which 35% was recoverable by amalgamation, and the remainder in the pyrites that amount to 2½ to 3% of the whole rock.

At 158 feet a drift has been run 59 feet east and 72 feet west along a small quartz vein, parallel to the strike of this band, that can be traced on the surface, 90 feet above, for 700 to 800 feet, and in the drift is ½ to 3 feet wide and assays from $2.50 to $32.00 per ton.

On the White Witch and Black Witch is another wide band with a 50-foot tunnel, but no returns were got concerning the probable value of this rock. The property is about 3,500 feet N.W. from the Silver King mines, and close to the road leading to the mine. It is crossed by the small stream, or Give-out Creek that might be utilized for a test mill but would not be large enough to supply ample water for all the year round for a large plant which low grade ore of this character would demand.

As this large body of low grade material could be easily mined, experiments are projected to ascertain whether, after paying the cost of mining, hauling, milling, concentrating and chlorination, a margin of profit would still remain provided a large amount of several hundred tons was milled daily. At the Alaska-Treadwell Mine, Alaska, large dividends are paid from rock yielding $2.65 per ton (1895) or a profit of $1.28 per ton. At the Homestake, South Dakota, the ore yields about $4.50 per ton, while at the Haile Mines, North Carolina, U.S.A., Mr. Thies has made a great success, treating by milling and chlorination, ore that *assays* $4.00 per ton in gold, of which ⅓ is free gold, and yields 2 to 25% sulphides; but in this work he has been greatly aided by the low cost of labour, much less than obtains in the West.

Fern Group.

This group comprises the *Fern* claim, Crown Grant, the *Eureka* and *Hidden Treasure*, 1,500 by 1,500 feet, Crown Grants applied for, and two fractional claims, the *Chicora* and *Foothill*, located 10 miles from Nelson, to Hall's Siding, on the Nelson and Fort Sheppard R.R., and then 4½ miles by trail to the mine, 3,500 feet above Nelson. Owned by Frank Fletcher, *et al.*, Nelson. This vein of white opaque quartz, carrying copper and iron-pyrites in the diabase porphyrites and the green schists, belonging to the series in which is the Silver King lode, is from 3 inches to 3½ feet wide, average perhaps 2 feet, strike N.E. by S.W., dip N.W. 50° to 70°.

Mine.—Beginning at the lowest workings, a 20-foot cross-cut tunnel intersects and then follows for 25 feet along the vein of 2 to 3 feet of decomposed quartz that will give good gold colours on panning. A 22-foot winze has been sunk on the vein, but was full of water. Above this an open cut again shows the vein, and 50 feet still higher up a 15-foot shaft is sunk along the vein, here 1 foot 9 inches wide; 50 feet further up the hill an open cut shows the vein to be 1½ to 2 feet wide, while about 200 feet above the first tunnel is Tunnel No. 2, 276 feet along the vein, that is variable in width from 4 inches to 3½ feet, and contains more sulphides as the zone of decomposition is passed. Tunnel No. 3 is 60 feet above No. 2, and 160 feet along the vein that at the beginning was 3 inches wide but widened out to 3½ feet. Near the mouth of No. 2 is the blacksmith shop and a Hammond 2-stamp prospecting mill, with stamps 850 lbs. each, drop 8 to 10 inches, 2 silver-plated amalgamating plates, punched metal screens and a small steam boiler. This mill was only run three days and the results were not learned. A small stream passes the mine, but a mill would be put up, probably, on Hall Creek, ½ mile distant. There is a good supply of good timber. On the Foothill another and parallel vein is now being opened up. Mr. Fletcher reports that 25 tons of ore, partly decomposed and partly unaltered rock, sent to the Pilot Bay smelter and sampled, assayed $39 in gold per ton.

THE ATHABASCA GROUP.

This group was not examined, but it consists of the *Athabasca*, *Alberta*, *Algoma*, and *Manitoba*, 175 acres, situated about two miles from Nelson, on Morning Mountain, and Mr. Albert J. Hill, M. E., has reported that "seven ledges of free-milling gold ore have been opened on the property, varying in thickness from one to eight feet, in every opening on which he detected free gold, the ore being quartz, with some iron and copper pyrites, and very little galena, and the veins in quartzone schists."

The Athabasca Gold Mining Co., Ltd., New Westminster, Pres. B. W. Shiles, Sec. G. O. M. Dockrill, with a capital stock of $1,000,000 in $1 shares, has been organised to acquire and exploit these claims, and development work is being proceeded with, with the intention of erecting a stamp mill.

Ainsworth Mining Division.

In this, the pioneer mining district of West Kootenay, in which Dr. Dawson, in 1889, found mining being actively carried on; this industry for some time back has been quietly progressing, but not with that advance the success of the present mines and the mineral indications would seem to warrant. This is due to several facts, one of which is that many were attracted to the high-grade silver-lead veins of the Slocan, whose early prospectors of 1891-2 flocked in from the town of Ainsworth after Eli Carpenter and John Seaton, making their difficult way up Kaslo Creek, located the Payne claim September, 1891. Again, many good properties, Crown-granted, owned by men who can afford to wait, now lie dormant, like others that carried ore of such a grade that was in earlier days hardly profitable, but now, with cheaper rates and easier means of shipment, should pay well if developed. Disastrous forest fires destroyed several good mining plants on claims on which work had fairly started, but has not since been resumed, and again, many have had an unwarranted lack of faith in the probable permanence of these veins and ore bodies, especially of those in the limestones, which have been considered as merely "pockets" and local, but to one who has worked in silver ore-bodies in limestone, as in Colorado, this pocket theory is not so alarming a bug-bear, as the general experience is that when one ore-shute is found others are almost invariably discovered on prospecting further along the line of break, up and along which have come from greater depths, the ore-bearing solutions that have impregnated the country rock in favourable places and formed ore-shutes.

The fact that at Ainsworth (or Hot Springs), where most work has been done, good veins of very profitable ore, are found in all the different geological horizons, and also that while many seem to be conformable to some extent to the stratification of these rocks, many cut through these formations, should strengthen one's belief in the probable persistence of these veins, and give greater confidence in beginning work on a good and liberal scale.

The tide of prospectors is spreading over this district, and from the territory at the north end of Kootenay Lake, along the Lardo and Duncan Rivers and their tributaries, and from Crawford and Hooker Creeks, and white Grouse Mountain, back from the east shores of the lake, came reports of locations of veins of high grade ore, while at Ainsworth itself new properties are being found and opened up. By the way, it will be seen that this district embraces a wide territory, and that in reality but a small part of it has become familiar to the prospector or explorer.

With large smelting plants in British Columbia, the demand will vastly increase for dry ores, or ore carrying a small or no percentage of lead to mix with the galena ores; and such dry ores as are found at Ainsworth will be in spécial demand and command favourable smelting rates when shipped in bulk, *i. e.*, not sacked, and there will be yet shipped large quantities of low grade ore now not very profitable.

Geology.

All the formations of the series detailed above, are found in this district, and in each formation of this series have been discovered valuable ore-bearing veins and deposits, mostly of silver or silver-lead, but also of gold-silver ores.

Ores and Ore-Deposits.

Ore-Deposits.

In the immediate vicinity of Ainsworth, and at the Blue Bell mine on the other side of the lake, many of the veins or ore-deposits appear to be conformable in most part with the very marked stratification of the metamorphic rocks but many others cut across the formation, and in many cases the veins present the usual characteristics of the typical cavity-filled tissure vein, while in others, as at the Skyline and Number One, the deposits have been formed by the impregnation and replacement of the country rock by ore and quartz, and sometimes by calcite.

However, on none of the mines west of the lake has there been done more than a comparatively small amount of work by which to form positive opinions doubtful of the permanence of these ledges, and certainly not enough yet to condemn them as being likely to soon play out, for even if one ore shute should be exhausted, further work on this horizon, nearly always indicated by slicken-sided walls, a narrow seam of gouge or other evidences of a fault tissure, will, in very many cases, disclose other ore-shutes.

ORES.—There is a considerable variety in the different grades of ore, there being

(*a.*) Solid galena ores carry a good silver value, as the little Phil, Black Diamond, Highland, Tariff, in which there is not enough zinc to bring the percentage above the smelter limit, or 10%. In some of the properties not now being worked, can be seen a large amount of blende that concentration would remove :

(*b.*) In the Number One, there is little galena or blende, but the chief and important sulphide is iron-pyrites, with white quartz and calcite, a very desirable smelting ore :

(*c.*) The Skyline ore is again different, being a quartz and lime matrix, carrying silver compounds, but a very small amount of sulphides :

(*d.*) In some claims the sulphides, as galena, are not found solid, but disseminated, usually through quartz, and in the case of the Silver Glance and the Wakefield veins, with the presence of gold :

(*e.*) From Crawford and Hooker Creeks, from samples seen and by report, the high silver gold values are carried in tetrahedrite or grey copper in quartz with galena :

(*f.*) At the Blue Bell mine, these large low grade ore-bodies consist of a calcareous matrix, with a small percentage of galena, iron and copper pyrites and pyrrhotite.

COSTS, ETC.

MINING.—The cost of mining is small, *i. e.*, for drifting or tunnelling $6 to $9 per foot, of sinking $10 to $16 per foot.

(*b.*) LABOR AND SUPPLIES can be got at the best figures, or about the same as in other parts of West Kootenay :

(*c.*) TRANSPORTATION of course is immensely aided by the main water-way of the lake, and from nearly all parts waggon roads or aerial cable trams can be built to the water front :

(*d.*) SMELTER CHARGES for the dry ores, *i. e.*, with little or no lead, run from $4 to $7 per ton, the maximum price being on account of an occasional excess of zinc ; for the purely lead ores $12.00 per ton, with a freight charge on all classes of ore to smelter of $8. Of the lead 90%, and of the silver 95%, are paid for at New York prices at time of settlement. For gold all paid for, if at least $2.00 in value are present.

NUMBER ONE.

This claim, 600 by 1,500 feet, Crown-granted, and a 5-acre mill-site, also Crown-granted, together with No. 3 claim, and interests in the E. W. R. North Extension and Oneida locations, form the property of the Brittania Mining Co., of Windsor, N. S., Pres., Chas. DeW. Smith, and Sec., A. E. Shaw, Windsor, N. S., Superintendant, Leander Shaw, Ainsworth. This mine, located 2½ miles west of Ainsworth, or 4½ miles by waggon road, and 2,500 feet above the lake, is one of the earliest worked mines in West Kootenay, considerable work having been done at the time of Dr. Dawson's visit in 1889, and up to the present time about 1,000 tons of ore and concentrates have been shipped. The ore body, as now developed by large stopes that are from 4 to 12 feet between walls, and nearly 300 feet long, would require very careful study with complete maps and models to explain its formation and relation to the enclosing rocks which belong to the Slocan slates series that at this point consists of limestones and shales and slates. The existence of many faults of very differing strikes and dips has certainly served to increase the apparent irregularity of the ore body, which, while having a general dip throughout the workings, is in places lying flat or dipping in exactly the opposite direction to the main direction, while in one part of the mine the ore-shute, divided into two flat-lying shutes, which the men worked out, leaving but a few feet of barren rock between. At the time of examination there was a good amount of ore in sight (Oct. 22nd), but the stoppage of the concentrator by lack of water was retarding mining, and some development work only was in progress. The ore is almost unique in its character. In the early workings considerable rich "carbonate" ore was mined, or the decomposed part of the ore-body immediately amenable to surface influences, but now the ore has a quartz and calcite gangue, or rather, the country rock is replaced in part by quartz and iron pyrites and some zinc blende, but very little galena, the silver value being in direct ratio to the amount of iron pyrites present, first-class, or shipping ore, averaging 75 ounces of silver, 3 to 8 lead, and seldom over the 10 zinc limit. The mine is now worked through a tunnel running N. 75 W. 375 feet, when it turns and follows along a fault wall 157 feet (W. 15 E.) and connects with a winze to the stopes, 35 feet above. This drift is to be continued, and when in 100 or 120 feet, will probably intersect the ore zone, and by connecting with an incline from the stope, now down 35 feet along the foot-wall, which here has a 45° pitch, the further exploration of the property should be made much easier, while giving a much better outlet for the ore, the present means, by the rapid advance of work, having become unhandy. The mill ore-bins are just below this tunnel level. No work is being done to exploit this property beyond the work under way in this ore-shute, but there can be little doubt that as the ground is further opened up along the ore-bearing horizon, as soon as this is definitely determined, if not too much obscured by faulting, or along the fault fissure through which the ore-bearing solutions have found access, and then a place of lodgment in this formation, that more ore and other ore-shutes will be developed and mined.

The surface improvements consist of several log cabins, boarding house, office, assay laboratory, stables, and the concentrating mill that has cost $16,000 to $17,000.

CONCENTRATOR.—For six months of the year sufficient water for milling purposes is available, and by putting in a flume to tap another small stream, it is expected that then there will be water for the whole year for the mill, with enough, part of the time, to supply power generated in the low-water season by the present steam engines. While some first-class ore is shipped direct, most of the product of the mine goes to the mill, the capacity of which is 18-20 tons per 24 hours, concentrating 8 to 1, yielding concentrates that average 295 to 300 ounces in silver, 4-8% lead, and usually less than 10% zinc. Experiments have shown that ore assaying 15 to 20 ounces silver per ton can be mined and concentrated with a good margin of profit.

The mill is 45 by 75 feet, with an addition along one side 15 feet by 75 feet, and is supplied with (*a*) 100-ton ore bins, (*b*) 1 Dodge ore crusher, (*c*) 2 7-foot trommels giving 3 sizes, (*d*) 3 geared rolls, (*e*) 4 4-compartment Hartz jigs and 2 4-compartment slime jigs (Hartz), (*f*) elevators and hydraulic classifiers, (*g*) 1 Frue Vanner 6 by 12 feet, and one Embrey or end-shake vanner 4 by 12 feet, and settling tanks. This machinery was supplied by Fraser and Chalmers, of Chicago, and the Colorado Iron Works, Denver, while (*h*) the 35 h.p. engine and boiler came from the Phœnix Iron Works, Meadowsville, Pa.

COSTS OF TRANSPORTATION of ore or concentrates in sacks, 160 lbs. each, to the lake landing at Ainsworth is $3.00 per ton; from thence to the smelter in the U.S., $8.00 per ton, while smelting charges are $6.50 for crude ores, and $4 per ton for concentrates, with a zinc penalty of 50 cents per unit over the 10% limit.

OTHER CLAIMS in this vicinity are:—*Lilly May*, and the *Dellie* which is now being actively developed by Mr. S. S. Bailey, late owner in the Payne group, near Sandon, who is running a 300-foot tunnel to connect with a shaft 100 feet deep, 10 men being at work. This claim is in the Slocan Slates series and about 1 mile N.W. of Number One mine.

The *Lilly May*, through which runs the Dellie vein, is under bond to Mr. Max. Stevenson of the Highlander, and Mr. T. J. Lendrum. In 1895 a shipment of 12 tons of ore is reported to have returned 160 ozs. of silver per ton. East and south of this claim may be mentioned:—*United*, title Crown Grant, with a vein, in green schists, of coarsely crystallized galena—not working, having had all the buildings destroyed by a forest fire—but at the top of the 190-foot shaft are piled 400 to 500 tons of concentrating galena ore, carrying a large percentage of zinc blende; the *Old Timer*, the southern extension of the United, with the same kind of ore. The *Krao*, title Crown Grant, owner A. W. McCune, suffered by the loss of all the buildings by fire and is not being worked. There is a shaft sunk on the vein, which lies in a greyish or bluish marble, or limestone, carrying more or less coarse cubed galena.

The *Neosha* is being worked with a force of 8 to 10 men, engaged in running a tunnel to connect with a shaft from which 100-oz. dry ore is said to have been mined. It is now being worked by an Exploration Co., Nelson, title Crown Grant.

The claim to the north of this one, the *Ontario*, is owned by the Braden Bros., of Kaslo, who have 3 men at work on the same vein as in the Neosha ground.

SKYLINE.

The *Skyline*, *Perhaps*, Crown-granted, and the *Morning Star*, 600 to 1,500 ft. claims located on the Slocan Slates series, near the granite area, 1 mile west of the Number One mine, and 6 miles by road from Ainsworth, are owned by A. W. McCune, of Salt Lake City, Utah.

As this property had stopped work for this year and all was closed down, with water said to be in the mine, I was unable to examine it, but during the year over 1,100 tons of ore were shipped. Mr. McConnell reports (Summary Report for 1895, pp. 33, 34):—

"The Skyline and No. 1 occur in limestone bands associated with the Slocan Slates, and are situated, the former about 200 yards and the latter about one and a half miles east of the granite area. The deposits worked in these mines are of a somewhat puzzling character, and would require extended study before conclusions of value could be arrived at concerning them. They appear to occupy fractured zones of considerable but unknown width, traversing the limestones and slates in a nearly north and south direction, and dipping to the west. The zones have been silicified, and impregnated with ore in a selective manner, by ascending solutions.

"The ore occurs in flattened ore bodies, occasionally 10 to 12 feet in thickness, which, in the case of the Skyline, according to Mr. Scott McDonald, the manager, often cross nearly horizontally from the foot to the hanging wall. The workings in the Skyline include an incline 87 feet deep, sunk on the lead, and a shaft farther to the west, 200 feet deep, from the bottom of which a drift 120 feet in length and an upraise of 40 feet lead to the incline and the chambers of ore now being worked. The Skyline ore consists of a porous silicious rock, carrying a dark mineral, probably mostly argentite, native silver and galena, along with some grey copper (tetrahedrite) and iron and copper pyrites. It averages from 45 to 50 ozs. in silver per ton. The present out put of from 10 to 15 tons per day is shipped directly to the Pilot Bay smelter, its silicious character rendering it valuable as a flux for the basic ores of the district.

During the past year, the ore has been shipped partly to the Pilot Bay and partly to the American smelters, and at a lower rate of transportation to the lakeside, by reason of the larger quantity of ore hauled, than for the Number One ore, although a mile farther up the road. The smelter returns from 74 lots, or over 2,000 tons in 1895 6, assayed from 35 to 119 ozs. in silver, or an average of 54 ounces per ton, and less than 5 lead, and of the large amount shipped during 1896, the silver varied from 51.5 to 74.5 ounces of silver per ton, or an average of 58 ounces per ton.

TARIFF.

Title, min. location. Area 600 by 1,500 feet. Located 1 mile south of Ainsworth, ⅓ mile west and about 550 feet above Kootenay Lake. Owned by Wm. Braden, Helena, Montana. On this property 6 men were working in the mine and 6 on the waggon road, ¾ mile long, being built from the mine to the lake side. The ore is (*a*) a very solid galena with fine and coarse crystals, with a little zinc blende, and (*b*) also in considerable amount, concentrating ore in a quartzose gangue. From an open cut Daniel Clark mined and shipped about 45 tons, in 1896, that yielded 30 ozs. of silver and 55 lead, and at this point an incline has been sunk 100 feet, 80 ft. under cover, and for this 80 ft. solid galena ore 1-2½ ft. wide, has been followed all the way down, while also in a drift 15 ft. northerly, the ore still continues, being 2-3 ft. wide. The vein, strike magnetic north and south or N. 25° E, and S. 25 W., dip west (mag.) 25°-30° is apparently conformable to the stratification of the schists and quartzites of the country rock, but in places there were evidences that the vein was slightly flatter and crossing the formation, the hanging wall being schist and the foot wall a bed of quartzite, 25-30 ft. thick, in which could also be seen more or less brecciated matter, under which has been found in an open cut another vein of galena, small as yet but of a very good grade. It is thought by some that all this bed of quartzite is mineralized, and may be concentrated, but as yet no work is done to test this. The vein is traced through the claim by cuts and strippings, and is said to be found in the extension claims on either end. On the dump was a large pile of first-class ore; and when the present exploratory work has sufficiently shown up the probable extent and value of this promising property, a more convenient system of mining will be inaugurated.

MILE POINT.

The *Mile Point* near the lake shore, south of Ainsworth, is under lease and bond to Mr. A. Stalberg, assayer, who is now working the property and shipping ore that runs 106 ozs. in silver and 4 % lead. Title, Crown Grant.

HIGHLANDER.

Title, Crown Grant. Located on a bluff below the main waggon road 1¼ miles S. W. of Ainsworth, on a parallel vein about 600 feet east of the Black Diamond, about 1000 ft. above the lake. Owned by Max. Stevenson, Philadelphia, Pa. A cross cut tunnel has been run in a bluff of gneiss 120 ft. S. 30 W. intersecting at 80 ft. in schist and quartzites a small vein of fine grained galena and zinc blende, with a little arseno-pyrites, 4 to 18 inches wide, along which are short drifts, 20 ft. N. 30 W and 10 feet S. 30 E. At 120 ft. was found the main vein (that outcrops on the surface along in close proximity to a dyke) along which is a drift 270 feet long, to be extended by contract 50 ft. farther N. 15° W. and S. 15° E. following under as a hanging wall a smooth striated fault plane, dipping west 45° or apparently at a slightly steeper angle than the dip of the planes of stratification. Below the wall the country rock has been much shattered and then cemented with quartz carrying galena and blende, forming a fair amount of concentrating ore. 27 feet from the tunnel a winze now nearly full of water was sunk 67 feet, from the bottom of which a cross-cut was run 52 ft. to the first vein, where it is said 5-6 ft. of low grade concentrating ore were cut. From the drift an upraise of 91 ft. to surface showed in places 8″ to 10″ of good ore and 2-4 feet of concentrating rock. Should sufficient ore be found to warrant the construction of a concentrator, there is a very good site for an aerial tramway down to the lake. During the year 1896, a small lot of 12 tons carrying very little lead, but 70 ozs. silver per ton, was sent to Everett, Wash., the smelter charge being $12, and freight $8.

LITTLE PHIL.

Title, Crown Grant. Location, on the main waggon road 1⅓ miles from Ainsworth. Owned by T. McGovern and Capt. Hayward, Ainsworth. This fractional claim of about 4.1 acres has been bonded to the Hon. N. Clark Wallace, Ontario, for $20,000, 10 % cash down. This vein out-cropping on the surface in the schists, was tapped by running in a cross-cut tunnel 442 feet along the line between the Little Phil and Black Diamond claims, intersecting at 72 ft., the above vein, strike about N. 55° W., dip S.W. 70°-80°, along which a drift is run 200 feet, showing solid large cubed galena ore, averaging 30 ounces in silver per ton for most of the distance, from 6 inches to 2 feet wide, with some "carbonate." In a short upraise was a fine showing of solid ore 3 ft. wide. In the main tunnel 282 ft. farther in, a second vein along a wall developed fissure wall, having a more northerly trend and south-westerly dip, has been followed to the north 100 feet disclosing a small amount of mixed galena ore. Considerable concentrating ore is seen, or galena in a matrix of quartz, some calcite and crushed country rock. At the time of visit no work was being done.

BLACK DIAMOND.

The *Black Diamond* and *Little Donald* claims, the southerly extension of the Little Phil, the former 282 by 300 ft., and the latter 600 by 1,500 ft., owned by Jno. F. Stevens, of the Great Northern R. R., St. Paul, have had considerable work done upon them, but were also idle, so that the underground workings were not examined, but it is reported that in 1895, 250 tons of ore were shipped that returned 33 ozs. silver and 66-70% lead. Other claims, believed to be located along this lead, as the *Maestro*, *Paymaster*, *Spokane* and *Trinket*, were lying unworked, although the last two have shipped ore in the past.

HIGHLAND.

Title, Crown Grant, area 600 by 1,500 ft. Located 1⅓ miles north of Ainsworth, ⅕ mile north of Cedar Creek, and about 3,000 feet west, and 1,100 feet above Kootenay Lake. Owner, E. D. Carter, *et al.*, Ainsworth. A tunnel has been driven 680 ft., N. 35 W., along a well-defined fissure plane, dip S. W. 70°-80°. At the face is exposed a width of about 10 feet of concentrating galena ore, in a white sugary quartz, that with fragments of country rock forms a breccia. Going towards the mouth, for 50 ft., some ore is in sight, and at this point is an upraise 120 ft., with an 80° slope, with nearly solid galena ore ⅓ to 2 feet thick, most of the way for 105 ft. 90 ft. above is being sunk a shaft, then 59 ft. deep, to connect with this raise, and good ore is also found in this working. For 285 ft. more along the tunnel more or less ore is seen, and at this point is another raise of 160 ft. to the surface. Thence out to surface but little ore has been found, but on the dump are several tons of first-class ore, of coarse and fine solid galena, carrying a little blende, and also considerable concentrating ore or galena and blende, in a matrix of quartz and fragments of country rock, which is a mica-gneiss of the Shuswap series. A mill-site has been located at the mouth of Cedar Creek, and a line surveyed thence for an aerial tramway, while in Cedar Creek is a fair amount of water. From a small shipment of several tons of the best ore, the returns were 40 ozs. in silver, and 75% lead. Number of men at work, 3. Superintendent, E. D. Carter.

OTHER CLAIMS in this vicinity are:—"*Josephine*," title Crown Grant, or the northern extension, on which this vein is found in some cuts throughout the length of the claim. A fractional claim, the "*Little Maggie*," and also to the S. E. the "*Libbie*," 600 by 1,500 feet, Crown Grant, owned by Mr. A. W. McCune, on which is a 40-ft. shaft, and a ledge of low grade ore, but with no work being done. The Josephine and the *Maggie* and *Esther May*, are the property of the owners of the Highland.

CANADIAN PACIFIC M. AND M. CO.

Canadian Pacific Mining and Milling Co., of Minneapolis. This company owns four Crown granted claims, of which the *Amazon*, *Budweiser* and *Superior*, are 600 by 1,500 feet, and the *Wakefield*, 1,500 by 1,500 ft., situated at the mouth of Woodbury Creek, 3½ miles up the lake north of Ainsworth. Capital stock, 500,000 shares at $1.00 each. Superintendent, J. R. Hardie, Ainsworth.

Woodbury Creek, carrying a good volume of water all the year round, runs down through a narrow gorge in the very hard gneiss, that has a strike north and south and a dip of about 30° to the west. Passing at nearly right angles, with a dip of 70-80 S. to the formation, are several well-defined fissure veins, 4 inches to 2, and in some places 4 feet wide of galena, with both large and fine crystals, and zinc blende in a quartz and calcite gangue, the ore in places being solid and 6-16 inches thick. High on the face of the cliff on the west side of the stream, is believed to be a ledge lying conformable with the formation, and of course nearly at right angles to these galena veins described, and now two tunnels are being driven in with Ingersoll-Sargeant machine drills, to the west along these veins, to intersect in depth the last mentioned ledge.

Down this gorge there has been built, at a cost of $6,000, a splendid flume 1,200 feet long, 3½ by 4 feet, to the mouth of the creek, where the water enters a 36-inch penstock or pipe, which at the bottom has a Y-connection to two Pelton wheels, under a head of 75 feet. A 42-inch Pelton is now running a 12-drill air compressor, made by the Ingersoll-Sargeant Drill Co., Montreal, while the mill will be run by a 6-ft. wheel, both wheels having a 5-multiple nozzle. Along the top of the covered flume run the air-pipe and track, and 500 feet farther to the farthest present workings from the mill.

Budweiser.—One of the tunnels was in 65 feet, and following along a fault plane above which the rock is much fractured and seamed with little quartz veins, carrying a small amount of copper and iron pyrites and some galena, also $3-5 in gold. Upon the face of the cliff could be seen a quartz vein, following along this line of break, while 25 feet to the north is a small parallel vein of galena. Between these two veins, or 25 feet, this rock, carrying a small percentage of sulphides, is said to be concentrating ore but this has yet to be proven by mill tests.

Two other prospecting tunnels are on this claim, one 60 feet long, in the wash, from which large boulders of brecciated rock have been taken, carrying a very fine grained galena, assaying 30-40 ozs. in silver. Another tunnel, 45 feet, followed a small vein of large cubed galena.

Amazon.—This tunnel, being run with a machine drill, was in 120 feet, following a galena-blende vein dipping also southerly 70 to 75°, with, in places, 8 to 14 inches of solid ore in quartz and calcite. This vein can be seen running up the face of the cliff, and in places is four feet wide, and what is rather unusual the ore carries considerable pyrrhotite. On another vein, 14 to 20 inches wide, two tunnels have been run in on either side of the creek, one for 140 feet the other for 120 feet.

Wakefield.—On the top of the bluff a shaft has been sunk 140 feet in another vein of mixed galena ore, 4 to 24 inches wide, that gives good assays in gold.

CONCENTRATOR.—This mill, situated ¼ mile from the lake, is being built by Mr. M. A. Halman, of Carterville, Missouri, U. S., who is equipping the mill with crushers, rolls, jigs, &c., from that place, and is following the Missouri method, or by exclusive use of jigs without vanners or slime tables. The ore bins are immediately below the tramway, and the capacity of the mill will be 75 tons per 24 hours. A tramway has been built for 1,100 feet to the lake side where is deep water, and ore and concentrates will be easily loaded into the steamers. Cost of mill, $12,000. Number of men employed, 20.

SILVER GLANCE, title, Min. location. Located 2 miles up Woodbury Creek, or 3½ miles by trail N. W. of Ainsworth. This claim was located Aug. 5th, 1896, by Wm. Franklin, Alex. McLeod, and F. L. Fitch, Ainsworth, the vein being discovered in the stream bed where it cuts through the schists. A good cabin has been built near the tunnel, which starts in on the vein just above high water mark, and follows it for 20 feet, at time of visit. This vein, strike east and west, magnetic, dip 60° S., has from 4 to 16 inches of ore with, in places, 2 to 3 feet of mineralized brecciated country rock and quartz, and has been disclosed for 2-300 feet by stripping. The ore is white sugary quartz, with galena, iron pyrites, and marcasite disseminated through, and assays (from samples) 50 to 232 ozs. silver, and $18 to $20 in gold. About 15 tons of ore are now at the tunnel mouth, and this winter the owners will proceed with development, also build a trail down the creek to the lake, above which it is about 1,200 feet. There is an abundance of water in the creek, and good timber on the claim.

BLUE BELL MINE AND PILOT BAY SMELTER.

Neither the Blue Bell mines or the Pilot Bay smelter was visited, as mining operations had been suspended, and the smelter was not in blast; however the following information is given as it may prove of interest to many. In the Summary Report for 1895, p. 33, Mr. McConnell states :—

"At Hendryx, the Blue Bell is in active operation. This mine is situated on a band of crystalline limestone interbedded with the Shuswap schists, which has been fractured in various directions. The ore, consisting mostly of low-grade galena and pyrrhotite with some blende, iron and copper pyrites, and their decomposition products, occurs either pure or disseminated through a calcareous and occasionally a silicious matrix.

It occupies irregular chambers in the limestone, some of which are of huge dimensions. The ore body being worked at present, including some large horses of limestone, measures approximately 70 feet in width by 200 feet in length and 150 feet in height. Forty thousand tons of pure and concentrated ores have been shipped from this mine during the year, and prodigious quantities remain in sight.

PILOT BAY SMELTER.—This plant is located on a small peninsula on the same side (or the east) of Kootenay Lake as the mine, but about 8 miles south. There are three main buildings, the roast house, smelter and concentrator, besides the smaller ones for offices, laboratories, workshops, etc. The concentrator contains two Blake crushers, 9 by 15 inches, 4 4-compartment jigs, 2 double Collum jigs, 2 two-table slime tables, and 2 Frue Vanners, and has a capacity of 200 tons of ore per 24 hours. There are four 17 by 65-foot reverberatory furnaces in the roast house of 12 tons capacity each per 24 hours, while in the smelter is one 100-ton water-jacketted blast furnace. In the engine room is a 150 h.p. Corliss engine for the concentrator and sampling works, an 85 h.p. engine for the blower, and a 30 h.p. engine for the dynamo, for the electric lighting of the whole works.

The ore is brought down from the mine on large scows and then hoisted up on an incline plane to a point whence it can be taken to any point desired. Mr. Hendryx states (*see* Minister of Mines Report, 1895) :—"Since commencing operations to the finish of the works, July 10th, 1894, to December 31st, 1895, the Kootenay Mining and Smelting Co. has expended in cash for purchase of machinery, labour, ores, etc., a sum exceeding $650,000. During the year 1895 the company has employed daily on the average 200 men, and has paid from their office on labour account, $170,000; for supplies, $85,622; for duties, $70,000; for freight, $92,500; for ores purchased, over $150,000."

The above-described Blue Bell property, consisting, in part, of the Blue Bell, Surprise, Black Hawk, and Silver King claims, and the smelter plant, equipment, etc., are the property of the Kootenay Mining and Smelting Co., Ltd. Capital stock, $2,300,000; general manager, A. B. Hendryx, Pilot Bay, B. C.

SOUTH FORK OF KASLO CREEK.

No examination was made of this part of the district, but mining work is now being done on several properties, such as those owned by the Gibson Mining Co., and others, on which it is reported veins of high grade silver-lead ore are being developed. On the "Montezuma," under bond to Messrs. C. L. Webb and E. C. Hughes, of Seattle, two tunnels are being driven, from the upper one of which a winze is being sunk on a vein of galena ore to the lower tunnel, 100 feet below and 270 feet long, in the face of which are said to be 1½ feet of solid galena ore, assaying 120 to 140 ounces of silver per ton.

CRAWFORD AND HOOKER CREEKS.

A trail now runs from Crawford Bay, on the east of Kootenay Lake, near Pilot Bay up Crawford Creek to the divide, and thence down the St. Mary's River to Fort Steele, in East Kootenay. Six miles from the lake a branch trail runs up Hooker Creek to the claims there located, and at the head of this creek, or 10 or 12 miles from the lake, at an altitude of 4,500 feet above the lake, is the Commonwealth group, comprising the *Commonwealth*, *Sultan* and *Republic*, now bonded to the London and British Columbia Gold Fields Co., Ltd. A tunnel is now in 150 feet along a ledge, said to be 4 to 16 feet wide, in which is quartz disseminated with galena, grey copper, silver sulphides and some gold. Plenty of timber and water are available close by. On the adjacent claim, the *Express*, a cross-cut tunnel is now in 90 feet, being run to cut two quartz veins, 2 to 2½ feet wide, carrying galena and grey copper.

From the *California* 3 tons of ore, taken from the surface, were shipped to the Pilot Bay smelter, 2 tons of which assayed 170 ounces of silver per ton and 37 lead.

The *Hidden Treasure* shipped 5 tons of similar grade of ore to the same smelter

A number of claims have been staked off on Crawford Creek.

Magnetic Variation.

The magnetic north is on the average about 25 east of the true north.

Weights.

The ton in all weights given contains 2,000 lbs.

The earlier publication of this report has been prevented by the delay in receiving important smelter returns, the copying of which has entailed considerable labour upon those who have so kindly assisted by sending exact and complete returns.

I have the honour to be,
Sir,
Your obedient servant,
WILLIAM A. CARLYLE,
Provincial Mineralogist.

Bureau of Mines,
Victoria, B. C.,
January 15th, 1897.

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ERRATA IN BULLETINS.

BULLETIN NO. 2—TRAIL CREEK.

(*a*.) Page 32. The capital stock of the Commander Mining and Smelting Co., Spokane, Pres., W. J. Harris, should be stated as $500,000 in $1 shares, instead of $1,000,000.

(*b*.) Page 32. The Palo Alto Mining Co. is registered at Victoria, B. C., and not at Spokane, Wash. Pres., L. F. Solly; Sec., C. Dubois Mason, Victoria.

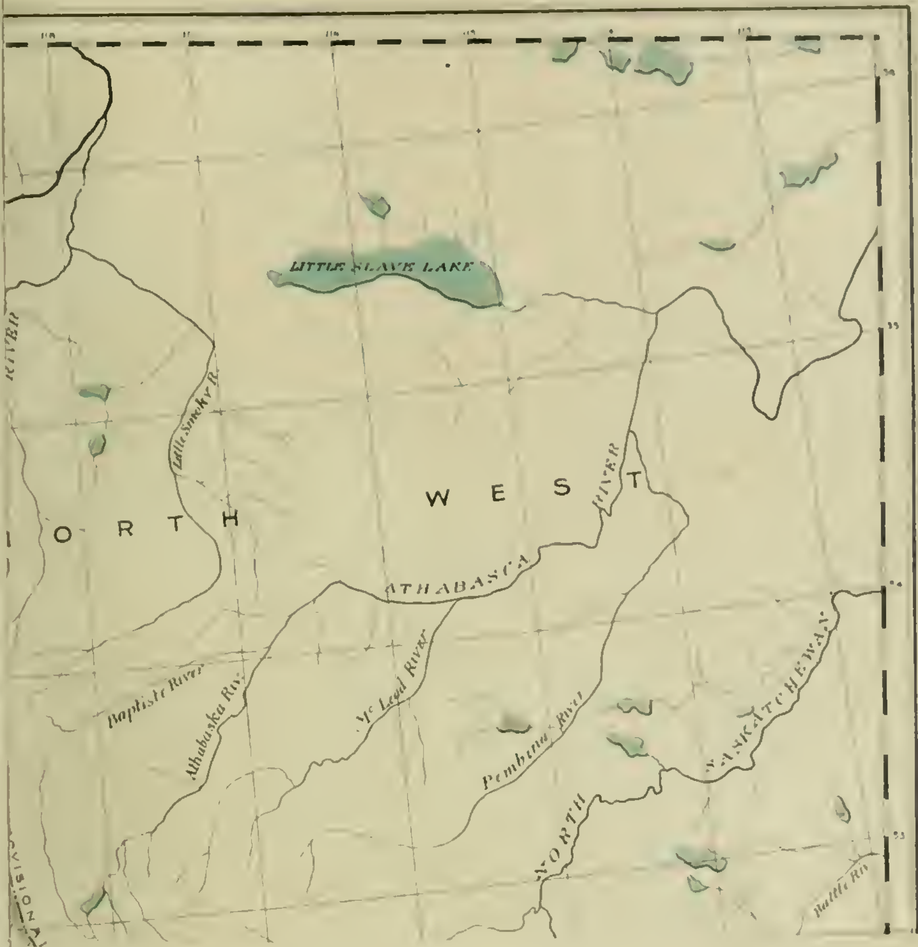
BULLETIN NO. 3—SLOCAN, NELSON AND AINSWORTH DIVISIONS.

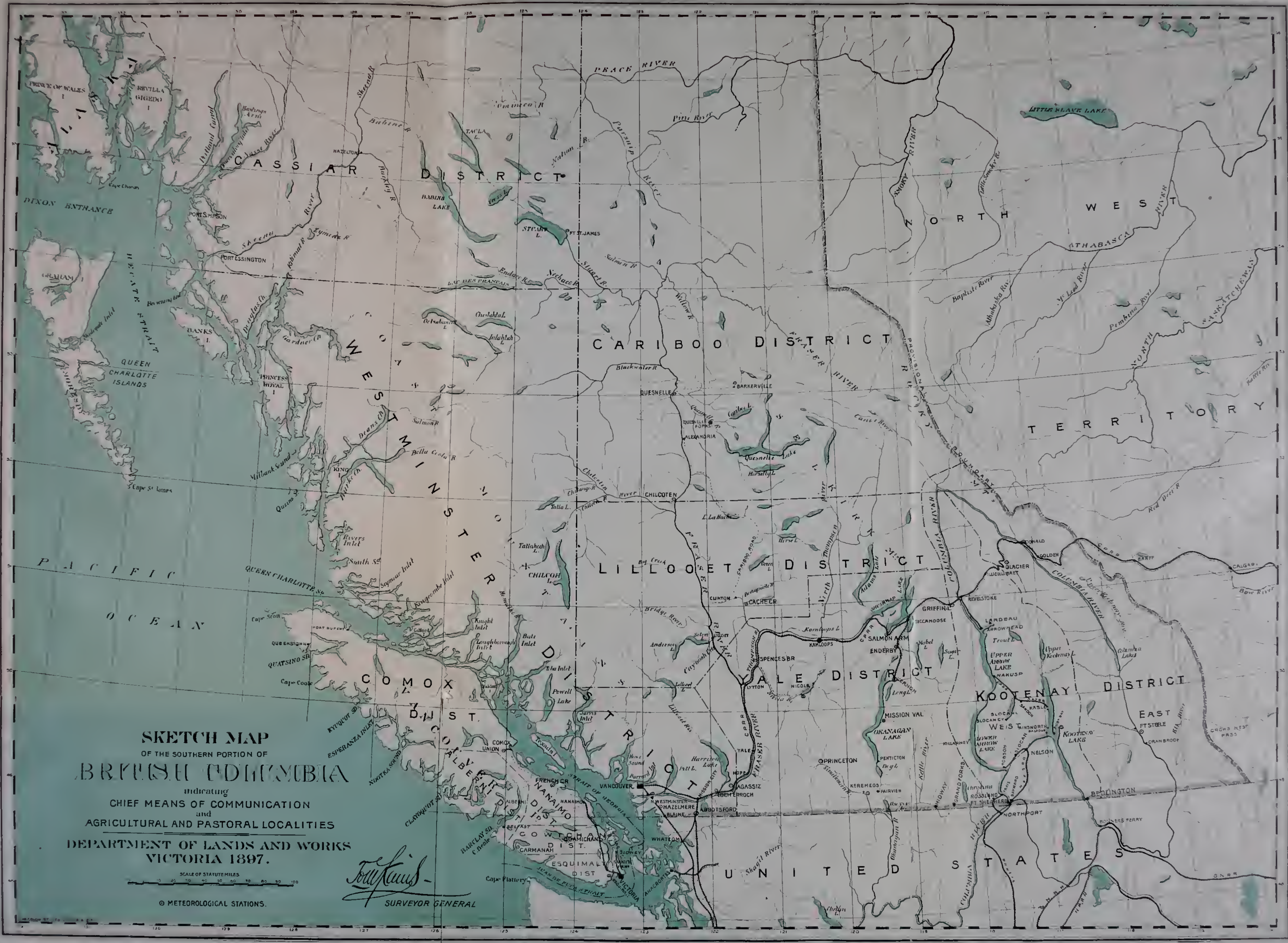
(*a*.) Pages 63, 64, 65, and 66. The following mines, the Wellington, Whitewater, Charleston, London Hill (in part), Bon Ton, Northern Belle, and other claims adjacent, were inadvertently stated as being located in the Slocan Mining Division, instead of in Ainsworth Mining Division. This will make a considerable difference in the mineral output of the Ainsworth Division, making the decrease for 1896 $56,000 instead of $198,000, as indicated in the tables given, this decrease being due, as stated, to the cessation of work on the Blue Bell Mine.

(*b*.) Page 50, line 47. "Silver King" should be "Slocan King."

(*c*.) Page 70, line 17. Direction of faulting should be to the south-east, as noted at time of visit, and not to the south-west, as stated.

(*d*.) Page 95, line 1. "Express" should be "Empress."


LITTLE SLAVE LAKE
RIVER
Little Smoky R.
ORTH
WEST
RIVER
ATHABASCA
Baptiste River
Athabaska Riv.
Mc Leod River
Pembina River
NORTH
SASKATCHEWAN
Battle Riv.
VISIONA



SKETCH MAP
OF THE SOUTHERN PORTION OF
BRITISH COLUMBIA
indicating
CHIEF MEANS OF COMMUNICATION
and
AGRICULTURAL AND PASTORAL LOCALITIES

DEPARTMENT OF LANDS AND WORKS
VICTORIA 1897.

SCALE OF STATUTE MILES
10 20 30 40 50 60 70 80 90 100

⊙ METEOROLOGICAL STATIONS.

Tom Kains
SURVEYOR GENERAL

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